FLOODWATER MANAGEMENT PLAN

LITTLE CALUMET RIVER

ENVIRONMENTAL ASSESSMENT

Chicago Metropolitan River Basin Plan

FLOODWATER MANAGEMENT PLAN
AND
ENVIRONMENTAL ASSESSMENT

LITTLE CALUMET RIVER

Cook and Will Counties, Illinois

Prepared under authority of the
Watershed Protection and Flood Prevention Act
(Section 6 of Public Law 566, 83d Congress,
68 Stat. 666), as amended

Prepared By:

Little Calumet River Steering Committee

With Assistance By:

U.S. Department of Agriculture
Soil Conservation Service and Forest Service

Metropolitan Sanitary District of Greater Chicago

Illinois Department of Conservation

May 1975

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INTRODUCTION

On March 1 1971, the Metropolitan Sanitary District of Greater Chicago (MSD) entered into a Cooperative Agreement with the Soil Conservation Service (SCS), United States Department of Agriculture, for Cooperative Studies for Preparation of the Chicago Metropolitan Area River Basin Plan. The costs of this planning effort are shared approximately equally, with MSD funding covering the preparation of detailed plans for the six watersheds which make up the study area.

This Floodwater Management Plan for the Little Calumet River is the second of the six detailed plans to be completed. The North Branch of the Chicago River Watershed has already similarly been planned under this cooperative Type 4 study. The other watersheds which will be planned include: Des Plaines River, Lower Salt Creek, Calumet-Sag Channel, and Poplar Creek.

The Little Calumet River Steering Committee assumed the leadership for the development of this plan and performed the role of decision maker in arriving at the Selected Plan presented herein. A full range of alternatives were evaluated; however, the intent of this report is to present the costs and effects of the Selected Plan and comparisons and trade-offs with alternative plans formulated to satisfy the environmental quality and national economic development objectives in accordance with the Water Resources Council's Principles and Standards for Water and Related Land Resource Planning. (*18*) 1/ 2/ The Selected Plan is simply a recommended system of measures chosen by the steering committee to satisfy its objectives for floodwater management in the study area.

This report is not a design manual. Final detailed design of each measure will be required before implementation of the Selected Plan can proceed.

1/ Italic numbers in parentheses refer to Literature Cited, page 205.

2/ All surveys, information, and data except as otherwise noted were collected by the Soil Conservation Service, United States Department of Agriculture and the Illinois Department of Conservation in cooperation with the Metropolitan Sanitary District of Greater Chicago during the river basin planning investigation.

The details of implementation are not outlined in this plan. The sponsor of this plan (Metropolitan Sanitary District of Greater Chicago) will prepare an "Implementation Program" providing for installation of the Selected Plan.

The study area limits were set at the Illinois-Indiana State line due to the selection by the State of Indiana of a plan for that portion of the watershed prepared by the U.S. Army, Corps of Engineers. The plan prepared by the Corps of Engineers for the Indiana portion of the watershed and this plan for the Illinois portion of the watershed are complementary independent plans which together address the entire Little Calumet River Watershed.

FLOODWATER MANAGEMENT PLAN

LITTLE CALUMET RIVER WATERSHED

Cook and Will Counties, Illinois

May 1975

SUMMARY OF PLAN

The Little Calumet River Study Area covers 136,500 acres in Cook and Will Counties, Illinois. (See map inside back cover of this report.)

Technical assistance in the preparation of the plan was furnished by the U.S. Department of Agriculture, Soil Conservation Service and Forest Service, the Metropolitan Sanitary District of Greater Chicago, and the Illinois Department of Conservation.

Floodwater damage is a major watershed problem and is increasing due to urbanization and flood plain encroachment. Flooding causes extensive damage to approximately 6,950 homes, personal property, and 142 businesses. In addition, flooding closes roads isolating many areas and interrupting transportation on major highways. Approximately 10,800 acres are subject to inundation by a projected condition 100-year frequency flood in the Little Calumet River Watershed. Future floodwater damages to existing development will average $3,134,000 annually.

Erosion on construction sites of areas being converted from agricultural, forest, and idle land uses to urban type developments produces sediment which adversely affects water quality in stream channels, clogs storm sewers, and deposits in downstream navigation channels. Erosion on 30,000 acres of agricultural and idle land also produces similar sedimentation and water quality problems.

The resources of this study area are not adequate to meet the recreation and open space needs. These needs will continue to increase as population and development increase in the area.

This Floodwater Management Plan has been developed to: (1) reduce flood damages by (a) floodwater retarding structures, (b) channel work, (c) flood plain regulations, (d) stream channel maintenance, and (e) flood proofing; (2) provide increased water based recreation; and (3) provide watershed protection and environmental enhancement by establishing an accelerated land treatment program.

Planned structural measures consist of three single purpose excavated floodwater retarding structures, one multi-purpose structure (floodwater storage plus recreational storage and associated facilities), and three sections of previously modified stream channel work totaling 3.8 miles. Total cost of the selected plan structural measures is estimated to be $30,647,800.

Average annual operation and maintenance costs are $107,400 for the planned structural measures.

Non-structural measures consist of a land treatment program, a flood plain management program to be accomplished by flood plain regulations, a channel operation and maintenance program, and a flood proofing program. These local programs will be implemented prior to the installation of structural measures.

Accelerated technical assistance for the total land treatment program has an average annual cost of $25,800. Technical assistance is primarily for the preparation of resource plans.

Total average annual benefits of the selected plan are $3,184,500. Total average annual costs are $2,133,500.

WATERSHED RESOURCES AND ENVIRONMENTAL SETTING

Physical Data

The Little Calumet River Study Area covers an area of 213.3 square miles (136,500 acres) in Will and Cook Counties, Illinois. The center of the study area is at the intersection of U.S. Route 30 and the Calumet Expressway. The watershed is bounded on the north by Blue Island , on the south by Monee, on the west by Tinley Park, and on the east by the Indiana state line. Municipalities located partly or wholly within the watershed include: South Holland, Harvey, Posen, Dixmoor, Robbins, Midlothian, Oak Forest, Tinley Park, Country Club Hills, Markham, Thornton, Lansing, Calumet City, Sauk Village, East Chicago Heights, Chicago Heights, South Chicago Heights, Park Forest, Hazel Crest, Homewood, Flossmoor, Matteson, Park Forest South, and Crete.

The downstream limit of the Study Area is the Little Calumet confluence with the Calumet-Sag Channel. Flow continues westward in the Calumet-Sag Channel to the Chicago Sanitary and Ship Canal. Flow then goes from the Chicago Sanitary and Ship Canal to the Des Plaines River, from the Des Plaines River to the Illinois River, and from the Illinois River to the Mississippi River. The watershed is part of the Upper Mississippi River Basin and lies within designated Water Resources Council Sub-Region 0712. (*17*)

Topographic features of this watershed were influenced by Pleistocene glaciation. These features include low morainic ridges, which dominate the southwestern half of the watershed, and the flat lakebed of glacial Lake Chicago with associated beach ridges which dominates the northeastern half of the watershed. (*19*) Glaciation and subsequent receding of Lake Chicago have left a youthful, poorly developed drainage pattern characterized by numerous poorly drained depressions in the morainal area and broad, poorly drained swales in the lakebed.

The flood plains are irregular in shape and variable in size. They are generally broad and flat in the glacial lakebeds and narrow where valleys are entrenched through moraines and beach ridges. Valley profiles are very irregular with relatively steep slopes through beach ridges and moraines and very flat slopes in the lakebed.

All of the major tributaries to the Little Calumet River rise in the southwestern part of the watershed, cut through the moraines, and flow across the lakebed area into the Little Calumet River. The Little Calumet River flows from east to west along the northern edge of the watershed. The highest land elevation in the watershed is 805 feet above mean sea level on the watershed divide near Monee. The minimum elevation is 558 feet at the Little Calumet's confluence with the Calumet-Sag Channel. Total relief is therefore 247 feet.

The watershed is underlain by Silurian age dolomite. Glacial and lakebed deposits ranging in thickness from a few feet to over 100 feet cover the bedrock. The dominant glacial deposit is till consisting of a dense, poorly sorted mixture of clay, silt, sand and rock fragments. Lenses of sand and gravel deposited by glacial meltwater occur within the till. The lakebed deposits vary in texture from clay and silt deposited in quiet water to sand and gravel deposited in beaches. Bedrock lies nearest the surface in the northern and central part of the watershed with several outcrops in streambeds and along Thorn Creek near its mouth.

Mineral deposits in the watershed include sand, gravel, clay, peat and dolomite. The number of mining operations has declined during recent years. Cook County mineral production (1971) was valued at $52,492,707. (2) The principal mineral production occurs in the Thornton area where dolomite is quarried.

Surface soils are sand, silt, silt loam, silty clay loam, silty clay or clay in texture. They reflect the texture of the glacial and lakebed deposits. The predominant soils are silt loam. A few areas have silty and sandy soils developed from wind and/or water deposited material on top of till. Approximately 80 percent of the undeveloped area has soils with limitations or constraints for urban developments.

A soil association map, general soils descriptions, interpretations, and limitations are provided as a guide for evaluation of the soils. Detailed investigations are recommended for specific information at particular locations.

The soils descriptions and interpretations are for soils in their natural state and not for disturbed areas. Soil interpretations are based on evaluations to a depth of 5 feet. Soils rated as "slight" have few limitations for their use. Soils rated as "moderate" have limitations that need to be recognized but can be overcome by correct planning and careful design. The "severe" rating means that limitations are so great that they are difficult to overcome and require special planning and design.

LITTLE CALUMET RIVER, ILLINOIS

ESTIMATED SOIL LIMITATIONS FOR SELECTED USES a/

SOIL ASSOCIATION	SOIL SERIES	PREDOMINANT SLOPE (%)	PERCENT OF SOIL ASSOCIATION	SOIL LIMITATIONS FOR: BUILDING SITES b/	SEPTIC TANK ABSORPTION FIELDS c/	LOCAL ROADS AND STREETS	INTENSIVE PLAY (PLAYGROUNDS)	INTENSIVE CROPPING
1 MORLEY MARKHAM HOUGHTON	MORLEY MORLEY MARKHAM HOUGHTON MINOR SOILS	2-7 7-12 2-7 0-1	28 7 20 15 30	MODERATE: 6 MODERATE: 6,7 MODERATE: 6 SEVERE: 1,2,3	SEVERE: 5 SEVERE: 5,7 SEVERE: 5 SEVERE: 1,3	SEVERE: 4,6 SEVERE: 4,6,7 SEVERE: 4,6 SEVERE: 1,2,3	MODERATE: 5,7 SEVERE: 5,6,7 MODERATE: 5,7 SEVERE: 1,2,3	MODERATE: 6,7 SEVERE: 6,7 MODERATE: 6,7 MODERATE: 1,3
2 MORLEY BEECHER ASHKUM	MORLEY MORLEY, ERODED BEECHER ASHKUM MINOR SOILS	2-7 7-12 0-4 0-1	40 10 20 15 15	MODERATE: 6 MODERATE: 6,7 SEVERE: 1,6 SEVERE: 1,6	SEVERE: 5 SEVERE: 5,7 SEVERE: 1,5 SEVERE: 1,5	SEVERE: 4,6 SEVERE: 4,6 SEVERE: 1,4,6 SEVERE: 1,4,6	MODERATE: 5,7 SEVERE: 5,6,7 MODERATE: 1,5 SEVERE: 1,3,6	MODERATE: 6,7 SEVERE: 6,7 SLIGHT SLIGHT
3 ELLIOTT MARKHAM	ELLIOTT MARKHAM MINOR SOILS	0-4 2-7	30 25 45	SEVERE: 1,6 MODERATE: 6	SEVERE: 1,5 SEVERE: 5	SEVERE: 1,4,6 SEVERE: 4,6	MODERATE: 1,5 MODERATE: 5,7	SLIGHT MODERATE: 6,7
4 NAPPANEE MONTGOMERY	NAPPANEE MONTGOMERY MINOR SOILS	0-7 0-1	50 25 25	SEVERE: 1,6 SEVERE: 1,6	SEVERE: 1,5 SEVERE: 1,5	SEVERE: 1,4,6 SEVERE: 1,4,6	MODERATE: 1,7 SEVERE: 1,5	MODERATE: 1,5,6 MODERATE: 1,5,6
5 FRANKFORT MONTGOMERY WAUCONDA	FRANKFORT MONTGOMERY WAUCONDA MINOR SOILS	0-4 0-1 0-2	40 25 15 20	SEVERE: 1,6 SEVERE: 1,6 SEVERE: 1,6	SEVERE: 1,5 SEVERE: 1,5 SEVERE: 1	SEVERE: 1,4,6 SEVERE: 1,4,6 SEVERE: 1,4	MODERATE: 1,5,7 SEVERE: 1,5 MODERATE: 1	MODERATE: 1,5,6 MODERATE: 1,5,6 SLIGHT
6 FRANKFORT NAPPANEE CHATSWORTH	FRANKFORT NAPPANEE CHATSWORTH, ERODED MINOR SOILS	0-4 0-7 7-12	35 25 15 25	SEVERE: 1,6 SEVERE: 1,6 SEVERE: 6,7,9	SEVERE: 1,5 SEVERE: 1,5 SEVERE: 5	SEVERE: 1,4,6 SEVERE: 1,4,6 SEVERE: 4,6,7	MODERATE: 1,5,7 MODERATE: 1,5,7 SEVERE: 7	MODERATE: 1,5,6 MODERATE: 1,5,6 SEVERE: 6,7,9
7 MAUMEE WATSEKA MONTGOMERY	MAUMEE WATSEKA MONTGOMERY MINOR SOILS	0-1 0-2 0-1	40 20 20 20	SEVERE: 1,2 SEVERE: 1,2 SEVERE: 1,6	SEVERE: 1,2 SEVERE: 1,2,8 SEVERE: 1,5	SEVERE: 1 MODERATE: 1 SEVERE: 1,4,6	SEVERE: 1 MODERATE: 1,9 SEVERE: 1,5	MODERATE: 1,9 MODERATE: 9 MODERATE: 1,5,6
8 MAUMEE BONO WARNERS	MAUMEE BONO WARNERS MINOR SOILS	0-1 0-1 0-1	45 20 10 25	SEVERE: 1,2 SEVERE: 1,6 SEVERE: 1,2,3	SEVERE: 1,8 SEVERE: 1,5 SEVERE: 1,2,3	SEVERE: 1 SEVERE: 1,4,6 SEVERE: 1,2,3	SEVERE: 1 SEVERE: 1,5 SEVERE: 1,2,3	MODERATE: 1,9 MODERATE: 1,5,6 MODERATE: 1,3
9 MONTGOMERY MILFORD MARTINTON	MONTGOMERY MILFORD MARTINTON MINOR SOILS	0-1 0-1 0-2	35 30 20 15	SEVERE: 1,6 SEVERE: 1,6 SEVERE: 1,6	SEVERE: 1,5 SEVERE: 1,5 SEVERE: 1,5	SEVERE: 1,4,6 SEVERE: 1,4,6 SEVERE: 1,4,6	SEVERE: 1,3,5 SEVERE: 1,3,5 MODERATE: 1,5	MODERATE: 1,5,6 SLIGHT SLIGHT
10 PLAINFIELD WATSEKA	PLAINFIELD WATSEKA MINOR SOILS	2-7 0-2	45 40 15	SLIGHT SEVERE: 1	SLIGHT 8 SEVERE: 1,2	SLIGHT MODERATE: 1	MODERATE: 7,9 MODERATE: 1,9	SEVERE: 7,9 MODERATE: 9
11 SAWMILL ROMEO ROCKTON	SAWMILL ROMEO ROCKTON MINOR SOILS	0-1 0-1 1-6	40 25 15 20	SEVERE: 1,3 SEVERE: 3,10 SEVERE 10	SEVERE: 3 SEVERE: 3,10 SEVERE: 8,10	SEVERE: 1,3,4 SEVERE: 1,3,10 SEVERE: 4,10	SEVERE: 1,3 SEVERE: 1,3,10 MODERATE: 7	MODERATE: 3 SEVERE: 3,9,10 MODERATE: 9,10

a/ SOME OF THE LIMITATIONS HAVE BEEN CHANGED FROM THOSE IN PUBLISHED SOIL SURVEYS BECAUSE OF ADDITIONAL DATA. MORE LIMITATIONS MAY NEED REVISION AS ADDITIONAL DATA IS RECEIVED.

b/ ALL FOOTINGS ARE ASSUMED TO BE BELOW NORMAL FROST DEPTH.

c/ FIELDS INSTALLED ON SOILS WITH EXCESSIVE PERMEABILITY MAY CONTAMINATE GROUND WATER.

KEY TO PRINCIPAL SOIL LIMITATIONS

1. SEASONAL HIGH WATER TABLE 2. UNSTABLE 3. FLOOD HAZARD 4. SUSCEPTIBLE TO FROST ACTION 5. SLOW PERMEABILITY
6. ADVERSE SOIL TEXTURE 7. EXCESSIVE SLOPE 8. EXCESSIVE PERMEABILITY 9. RESTRICTED OR LOW AVAILABLE WATER 10. SHALLOW TO BEDROCK

EXPLANATION OF COLUMNS IN THE TABLE

SOIL ASSOCIATION:

THE NUMBERS AND COLORS IN THIS COLUMN CORRESPOND WITH THE NUMBERED SOIL ASSOCIATIONS (GENERAL SOIL AREAS) ON THE GENERAL SOIL MAP OF THE LITTLE CALUMET WATERSHED. EACH SOIL ASSOCIATION IS NAMED FOR THE MAJOR SOILS.

SOIL SERIES & PERCENT OF ASSOCIATION:

THIS COLUMN SHOWS THE APPROXIMATE PERCENT OF EACH MAJOR SOIL IN EACH ASSOCIATION, AND THE TOTAL PERCENT OF ALL THE MINOR SOILS.

BUILDING SITES

THE RATINGS APPLY TO THE USE OF SOILS FOR RESIDENCES OR BUILDINGS OF THREE STORIES OR LESS WITH BASEMENT AND PUBLIC SEWERS. THIS RATING DOES NOT CONSIDER THE USE OF ON-SITE SEPTIC TANK ABSORPTION FIELDS. FACTORS CONSIDERED IN MAKING THE RATINGS ARE: WETNESS HAZARDS, FLOODING HAZARD, SLOPE, LIMITATIONS FOR FOUNDATIONS, CLAY CONTENT, DEPTH TO BEDROCK, EROSION HAZARD, AND LIMITATIONS FOR LAWNS, TREES, AND SHRUBS.

SEPTIC TANK ABSORPTION FIELDS

RATINGS APPLY TO AREAS NEEDED FOR PROPER DISTRIBUTION OF EFFLUENT INTO THE SOIL WITHOUT HAZARDS TO HEALTH OR PROPERTY. FACTORS CONSIDERED ARE: WATER TABLE, PERMEABILITY, FLOODING, SHALLOW BEDROCK, CLAY CONTENT, AND ORGANIC MATERIAL

LOCAL ROADS AND STREETS

THE LIMITATION RATINGS GIVEN IN THIS COLUMN APPLY TO THE USE OF SOILS FOR CONSTRUCTION AND MAINTENANCE OF IMPROVED LOCAL ROADS AND STREETS THAT HAVE ALL-WEATHER SURFACING -- COMMONLY OF ASPHALT OR CONCRETE. INCLUDED FROM CONSIDERATIONS IN THE RATINGS ARE SUPERHIGHWAYS FOR FAST-MOVING HEAVY TRUCKS. THE FACTORS CONSIDERED ARE: NATURAL DRAINAGE, TEXTURE, PRESENCE OF ORGANIC SOILS, DEPTH TO BEDROCK, DEPTH TO WATER TABLE, SUSCEPTIBILITY TO FROST HEAVE, FLOODING HAZARD, PERCENT SLOPE, AND SHRINK-SWELL POTENTIAL.

INTENSIVE PLAY (PLAYGROUNDS)

AREAS DEVELOPED FOR ORGANIZED GAMES SUCH AS BASEBALL, FOOTBALL, TENNIS, AND THE LIKE. THEY ARE SUBJECT TO HEAVY FOOT TRAFFIC AND GENERALLY REQUIRE A LEVEL SURFACE, GOOD DRAINAGE, AND A SOIL TEXTURE AND CONSISTENCY THAT GIVES A FIRM SURFACE. IT IS ASSUMED THAT GOOD VEGETATIVE COVER CAN BE ESTABLISHED AND MAINTAINED ON AREAS WHERE NEEDED.

INTENSIVE CROPPING

RATINGS ARE BASED ON THE CAPABILITY OF THE SOILS, WHEN PROPERLY MANAGED, TO SUSTAIN ROW CROPPING WITHOUT RISKS OF SERIOUS SOIL DAMAGE. FEATURES AFFECTING IT ARE SOIL TEXTURE, PERMEABILITY, AVAILABLE WATER CAPACITY, SLOPE AND HAZARDS OF EROSION, FLOODING OR PONDING.

GENERAL SOIL MAP

THE GENERAL SOIL MAP OF THE LITTLE CALUMET WATERSHED IN ILLINOIS SHOWS 11 MAIN PATTERNS OF SOILS CALLED SOIL ASSOCIATIONS. EACH ASSOCIATION CONTAINS A FEW MAJOR SOILS AND SEVERAL MINOR SOILS, AND IS NAMED FOR THE MAJOR SOILS. THE SOILS IN ONE ASSOCIATION MAY BE IN ANOTHER, BUT IN A DIFFERENT PATTERN.

THE GENERAL SOIL MAP IS USEFUL TO PEOPLE WHO WANT A GENERAL IDEA OF THE SOILS, WHO WANT TO COMPARE DIFFERENT PARTS OF THE WATERSHED OR WHO WANT TO KNOW THE LOCATION OF LARGE TRACTS THAT ARE SUITABLE FOR A CERTAIN KIND OF FARM OR NONFARM LAND USE. SUCH A MAP IS NOT SUITABLE FOR PLANNING THE MANAGEMENT OF A FARM OR FIELD, OR FOR SELECTING THE EXACT LOCATION OF A ROAD, BUILDING, OR SIMILAR STRUCTURE BECAUSE THE SOILS IN ANY ONE ASSOCIATION ORDINARILY DIFFER IN SLOPE, DEPTH, DRAINAGE, OR OTHER CHARACTERISTICS THAT AFFECT MANAGEMENT.

DETAILED SOIL MAPS AND INFORMATION ON SOILS AND SPECIFIC USES IS AVAILABLE FOR MUCH OF THE AREA ENCOMPASSED BY THE LITTLE CALUMET WATERSHED. FOR THIS DETAILED INFORMATION, PLEASE CONTACT THE FIELD OFFICE OF THE SOIL CONSERVATION SERVICE IN THE INDIVIDUAL COUNTIES CONCERNED.

SOIL INTERPRETATIONS

THE INTERPRETIVE TABLE TO THE LEFT, ENTITLED "ESTIMATED SOIL LIMITATIONS FOR SELECTED USES", PROVIDES SOIL INTERPRETATIONS FOR 5 SPECIFIC USES FOR EACH OF THE 11 SOIL ASSOCIATIONS SHOWN ON THE GENERAL SOIL MAP OF THE LITTLE CALUMET WATERSHED. THE APPROXIMATE PERCENT OF THE ASSOCIATION OF EACH MAJOR SOIL AND THE TOTAL PERCENT OF ALL OF THE MINOR SOILS IS GIVEN. ESTIMATED LIMITATIONS FOR EACH OF THE NAMED SOILS FOR EACH OF THE 5 USES IS GIVEN IN TERMS OF SLIGHT, MODERATE, OR SEVERE LIMITATIONS. BESIDE EACH OF THE RATINGS THE LIMITING SOIL PROPERTIES OR FEATURES ARE GIVEN BY LISTING ONE OR MORE NUMBERS. THESE NUMBERS CORRESPOND WITH THOSE LISTED IN THE "KEY TO PRINCIPAL SOIL LIMITATIONS", AT THE BOTTOM OF THE TABLE. SOILS RATED AS SLIGHT ARE ESTIMATED TO HAVE NO PRINCIPAL SOIL LIMITATIONS AND ARE NOT REFERENCED TO THE KEY EXCEPT FOR SEPTIC TANK ABSORPTION FIELDS.

SOIL LIMITATION CLASSES

SOILS RATED AS "SLIGHT" HAVE FEW OR NO LIMITATIONS FOR THEIR USE. SOILS RATED AS "MODERATE" HAVE LIMITATIONS THAT NEED TO BE RECOGNIZED, BUT CAN BE OVERCOME BY CORRECT PLANNING AND CAREFUL DESIGN. A "SEVERE" RATING MEANS THAT LIMITATIONS ARE SO UNFAVORABLE THAT THEY ARE DIFFICULT TO OVERCOME AND REQUIRE SPECIAL PLANNING AND DESIGN. IN SOME CASES, THE COSTS TO OVERCOME THE LIMITATIONS ARE NOT ECONOMICALLY FEASIBLE.

COLORED CIRCLES

THE COLORED CIRCLES SHOW THE PROPORTIONATE EXTENT, OR RELATIVE PERCENTAGE, OF THE LIMITATIONS OR SUITABILITY OF EACH SOIL ASSOCIATION AS A WHOLE FOR A SPECIFIED USE.

- INDICATES SLIGHT OR NO LIMITATIONS
- INDICATES MODERATE LIMITATIONS
- INDICATES SEVERE LIMITATIONS
- MINOR SOILS, BECAUSE OF THEIR COMPLEXITY, WERE NOT RATED

USDA SOIL CONSERVATION SERVICE

5-S-35,002

SOIL ASSOCIATION LEGEND

1 **MORLEY-MARKHAM-HOUGHTON ASSOCIATION:** DEEP, WELL, AND MODERATELY WELL DRAINED SLOPING SOILS THAT ARE FORMED IN SILTY CLAY LOAM TILL AND SOME POORLY DRAINED DEPRESSIONAL SOILS THAT ARE FORMED IN ORGANIC SEDIMENTS.

2 **MORLEY-BEECHER-ASHKUM ASSOCIATION:** DEEP, WELL-DRAINED TO POORLY DRAINED, MODERATELY SLOW TO SLOWLY PERMEABLE SOILS THAT ARE FORMED IN LOESS AND THE UNDERLYING SILTY CLAY LOAM TILL.

3 **ELLIOTT-MARKHAM ASSOCIATION:** DEEP, WELL-DRAINED TO MODERATELY WELL DRAINED, AND SOMEWHAT POORLY DRAINED, MODERATELY SLOW TO SLOWLY PERMEABLE SOILS THAT ARE FORMED IN LOESS AND THE UNDERLYING SILTY CLAY LOAM TILL.

4 **NAPPANEE-MONTGOMERY ASSOCIATION:** DEEP, SOMEWHAT POORLY DRAINED AND POORLY DRAINED, SLOWLY PERMEABLE SOILS THAT ARE FORMED IN SILTY CLAY TILL OF LAKEBED SEDIMENTS.

5 **FRANKFORT-MONTGOMERY-RAUCONDA ASSOCIATION:** DEEP, SOMEWHAT POORLY DRAINED AND POORLY DRAINED SLOWLY PERMEABLE SOILS THAT ARE FORMED IN SILTY CLAY TILL OR LAKEBED SEDIMENTS, AND SOMEWHAT POORLY DRAINED, MODERATELY PERMEABLE SOILS THAT ARE FORMED IN STRATIFIED OUTWASH.

6 **FRANKFORT-NAPPANEE-CHATSWORTH ASSOCIATION:** DEEP, SOMEWHAT POORLY DRAINED, SLOWLY PERMEABLE SOILS THAT ARE FORMED IN SILTY CLAY TILL.

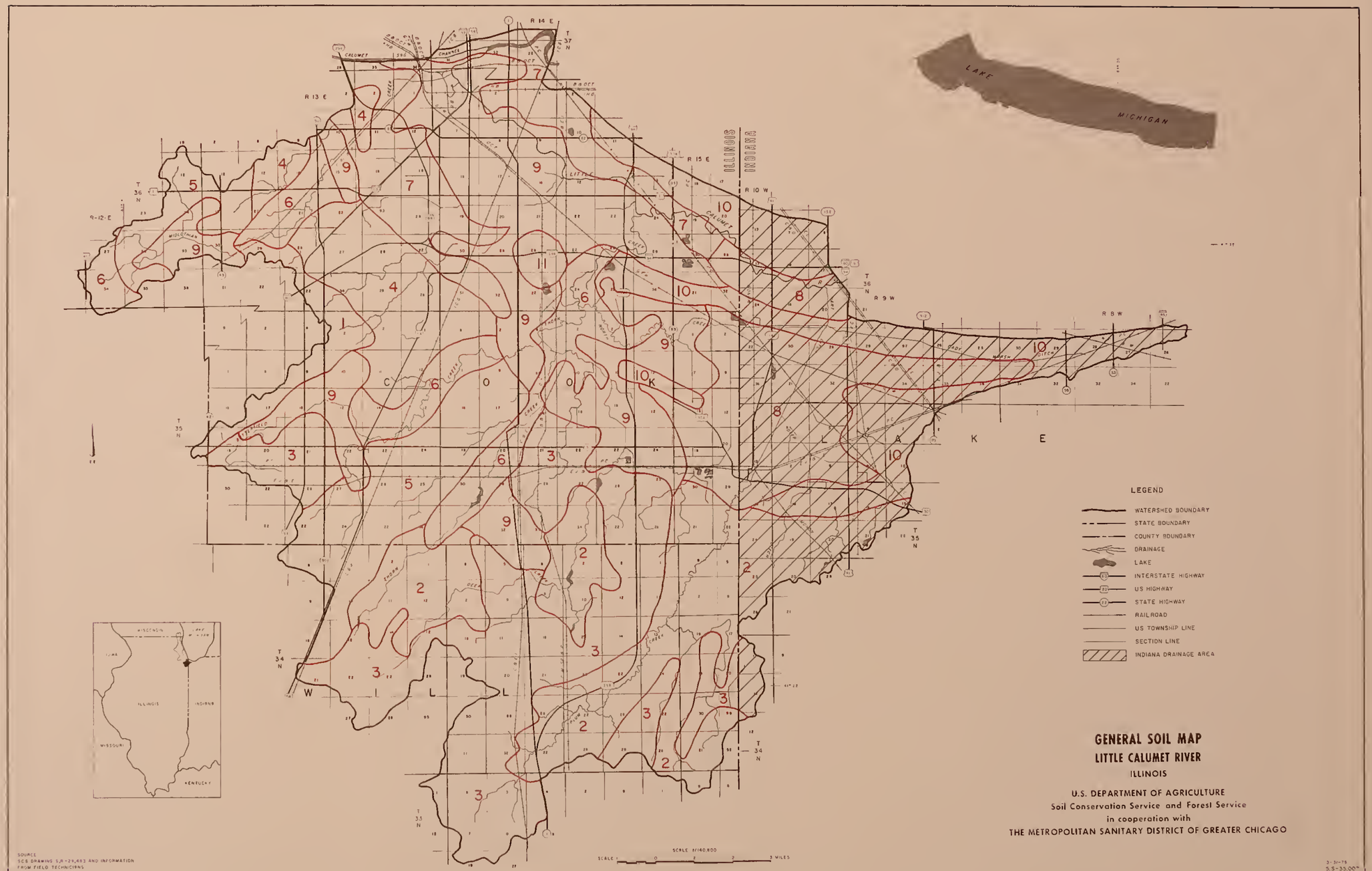
7 **WAUPEE-WATSEKA-MONTGOMERY ASSOCIATION:** VERY POORLY DRAINED TO SOMEWHAT POORLY DRAINED, NEARLY LEVEL AND DEPRESSIONAL SOILS THAT ARE FORMED IN COARSE-TEXTURED TO FINE-TEXTURED LAKE SEDIMENTS.

8 **WAUPEE-ROND-WARNERS ASSOCIATION:** DEEP, DEPRESSIONAL AND NEARLY LEVEL, VERY POORLY DRAINED SOILS THAT FORMED IN COARSE-TEXTURED TO FINE-TEXTURED LAKE SEDIMENTS.

9 **MONTGOMERY-MILFORD-MARTINTON ASSOCIATION:** DEEP, POORLY DRAINED AND SOMEWHAT POORLY DRAINED, NEARLY LEVEL SOILS THAT ARE FORMED IN DEPOSITS OF SILT AND CLAY.

10 **PLAINFIELD-WATSEKA ASSOCIATION:** DEEP, MODERATELY SLOPING TO NEARLY LEVEL, EXCESSIVELY DRAINED AND SOMEWHAT POORLY DRAINED SOILS THAT FORMED IN COARSE-TEXTURED OUTWASH.

11 **SAWMILL-ROMEO-ROCKTON ASSOCIATION:** NEARLY LEVEL TO MODERATELY SLOPING, POORLY DRAINED TO WELL-DRAINED SOILS THAT ARE FORMED IN ALLUVIAL SEDIMENTS AND SOILS FORMED IN LAYERS OF ALLUVIUM AND THE UNDERLYING LIMESTONE BEDROCK.



GENERAL SOIL MAP
LITTLE CALUMET RIVER
ILLINOIS

U.S. DEPARTMENT OF AGRICULTURE
Soil Conservation Service and Forest Service
in cooperation with
THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

SOURCE
SCS DRAWING SJR-29,483 AND INFORMATION FROM FIELD TECHNICIANS
POLYCONIC PROJECTION

3-31-75
5.5-35.00*

Average annual precipitation is 33 inches based on Illinois State Water Survey data. March through October precipitation averages 3 inches per month. November through February precipitation averages 2 inches per month. Precipitation which causes significant flooding occurs on the average of one time every two years. Average annual runoff is 9 inches. Average annual snowfall is 30 inches. (*6*)

January temperatures range from a normal maximum of 35°F to a normal minimum of 19°F. During an average winter, the temperature will fall below 0°F on 12 days. July temperatures range from a normal maximum of 87°F to a normal minimum of 64°F. During an average summer, temperature will rise above 90°F during 30 days. (*6*)

Lake Michigan has a major impact on water resource needs in the Little Calumet River Watershed. At the present time, 36 million gallons of water per day are withdrawn from Lake Michigan for municipal and industrial water supplies within the watershed. (*11*) The Lake supplies over 60 percent of water supply use. The remaining water supply is provided by ground water. Most villages in the southern and western parts of the watershed utilize ground water for their supplies. This water is being withdrawn from deep sandstone aquifers at a rate that exceeds natural recharge (mining). Although concern about mining has been expressed by some villages, the Illinois State Water Survey projects that mining can supply water needs until about the year 2000. Mining is accelerating the intrusion of deeper, saline groundwater. Total dissolved solids are excessive now and will worsen. (*12*)

The following estimates of current (1970) and future (2000) land use are based on data supplied by the Northeastern Illinois Planning Commission and consultation with the Department of Agriculture's Economic Research Service and Forest Service: (*4*)

LAND USE	ACRES	
Developed	1970	2000
Residential	25,200	34,600
Manufacturing	2,300	3,900
Commerce	5,800	6,500
Public Buildings	3,700	4,500
Public Open Space	13,600 1/	27,700
Transportation, Communication and Utilities	4,800	4,800
Streets	10,300	14,800
SUBTOTAL	65,700	96,800
Undeveloped		
Idle	6,500	1,800
Agricultural	58,300	36,700
Forest Land (Private)	6,000	1,200
SUBTOTAL	70,800	39,700
TOTAL	136,500	136,500

1/ 13,200 acres are forested.

Undeveloped land constitutes some 70,800 acres. Some 58,300 acres of this land is agricultural. About 6,500 acres of land has shifted from agricultural production to idle land because of imminent development and/or farming operations becoming uneconomical units. Most of this land is owned by developers. Private forest land constitutes 6,000 acres.

About 30,000 acres are being intensively cropped. A corn and soybean rotation is being followed on about one-half of the cropland. Commercial vegetables are being grown on the remainder. Cook County is the leading onion set producing county in the nation. Most onion sets produced in Cook County are grown in this watershed.

About 10,800 acres would be inundated by the occurrence of a projected condition 100-year frequency flood. An estimated 7,300 acres of this flood plain are now developed (committed to a specific use) with public open space occupying 1,900 acres of the developed area. Undeveloped flood plain totals 3,500 acres.

Urbanization is proceeding in a generally southerly direction in the watershed, with the bulk of the population in the Cook County portion of the watershed. Problems of drainage and surface water management are the major obstacles to development of the relatively flat, poorly drained lands.

Much of this area was originally swampland or prairie interspersed with swamp and marshes. Agricultural development required drainage modifications beginning about 100 years ago. Of particular note, the truck farming operations of the "South Holland Dutch" near South Holland, was the locale of Edna Ferber's novel So Big.

Urbanization southward along the Illinois Central Railroad began to accelerate after 1900 with improved commuter service. At the World's Fair of 1893 on the downtown lakeshore area, began plans to move many of the industries and grain elevators located on the downtown lake front to the southern lakeshore area. This was followed by development of the South Chicago, Gary, and Hammond steel and industrial complex.

Further urbanization of agricultural land has required more extensive drainage modifications with the subsequent gradual destruction of most remaining natural vegetation, swamps, and wetland areas. A total of 26 separate wetland areas, having a combined area of 405 acres, have been identified. These wetlands were classified according to Wetlands of the United States, Department of Interior, Fish and Wildlife Service, Circular 39 as follows: (*13*)

1. SE 1/4 of SW 1/4, Sec. 16, T36N, R13E. A type 3 inland shallow fresh marsh of about 10 acres (in process of being filled).

2. NW 1/4 of SE 1/4, Sec. 20, T36N, R13E. A type 2 inland fresh meadow of about 4 acres in Yankee Woods Forest Preserve.

3. NE 1/4 of SE 1/4, Sec. 29, T36N, R13E. A type 3 inland shallow fresh marsh of about 5 acres in Tinley Park.

4. Sec. 28, T36N, R13E. A type 6 shrub swamp of about 10 acres.

5. SE 1/4 of SE 1/4, Sec. 8, T36N, R13E. A type 4 wetland of about 5 acres. Surrounded by about 10 acres of type 3 inland shallow fresh marsh.

6. SE 1/4 of SW 1/4, Sec. 9, T36N, R13E. A type 4 inland deep fresh marsh surrounded by a type 3 wetland. Total area equals about 40 acres.

7. Center of Sec. 9, T35N, R13E. A type 3 inland shallow fresh marsh of about 15 acres.

8. SE 1/4 of SW 1/4, Sec. 21, T35N, R13E. A type 5 wetland of about 5 acres.

9. SE 1/4 of SE 1/4, Sec. 28, T35N, R13E. A type 5 wetland of about 3 acres.

10. SW 1/4 of NW 1/4, Sec. 14, T35N, R13E. A type 3 inland shallow fresh marsh of about 4 acres.

11. SW 1/4 of SE 1/4, Sec. 11, T35N, R13E. A type 3 inland shallow fresh marsh of about 5 acres.

12. NW 1/4 of Sec. 10, T34N, R14E. A type 3 inland shallow fresh marsh of about 15 acres at upper end of Deer Lake.

13. SW 1/4 of Sec. 2, T34N, R14E. A type 3 inland shallow fresh marsh of about 10 acres bordered by a housing development.

14. SE 1/4 of NW 1/4, Sec. 29, T35N, R15E. A type 3 inland shallow fresh marsh of about 6 acres.

15. SE 1/4 of SW 1/4, Sec. 25, T36N, R14E. A type 5 wetland of about 3 acres.

16. NW 1/4 of NE 1/4, Sec. 30, T35N, R9W. A type 6 shrub swamp of about 6 acres.

17. SW 1/4 of SW 1/4, Sec. 20, T35N, R9W. A type 5 wetland of about 3 acres.

18. SW 1/4 of SE 1/4, Sec. 20, T35N, R9W. A type 3 inland shallow fresh marsh of about 5 acres.

19. SW 1/4 of NE 1/4, Sec. 19, T35N, R9W. A type 5 wetland of about 3 acres.

20. SW 1/4 of SE 1/4, Sec. 18, T35N, R9W. A type 3 inland shallow fresh marsh of about 3 acres.

21. SE 1/4 of SE 1/4, Sec. 13, T35N, R10W. A type 3 inland shallow fresh marsh of about 5 acres.

22. Sections 17 and 16 in vicinity of U.S. Highways 41 and 30. About 40 acres of types 3, 4, and 5 wetlands interspersed through a subdivision.

23. SW 1/4, Sec. 3, T35N, R9W. Types 3 and 4 wetlands totaling about 20 acres.

24. NE 1/4, Sec. 4, T35N, R9W. A type 4 inland deep marsh of about 15 acres.

25. Center of Sec. 34, T35N, R9W. A type 5 wetland of about 5 acres with a type 6 shrub swamp margin.

26. Sections 25, 30, and 29, T36N, R8 and 9W. Cady Marsh is predominantly a type 4 wetland of about 150 acres lying along the north side of Cady Marsh Ditch.

The dominant forest types are oak-hickory (upland sites) and elm-ash-cottonwood (flood plains). Species include the oaks, hickories, elm, river birch, ash, cottonwood, willow, and soft maple. Approximately one percent of the forest land is in the flood plain. None of the forest land is considered commercial because of its rapid development for urban, public, and industrial uses.

Most stands are mature or sawtimber size. Many mature stands occur within the forest preserve districts of Cook and Will County. The hydrologic condition of the present forest stands is good. Ground cover is good to excellent.

A total of 46 lakes and ponds equal to or greater than 5 surface acres presently exist. Wampum Lake and Sauk Lake are most notable. Wampum Lake is located one mile east of Thornton in Zander's Woods Forest Preserve. It was dug to provide fill for Calumet Expressway and has a surface area of 35 acres and a maximum depth of 13 feet. Sauk Lake was created by damming Thorn Creek and is located in Sauk Trail Woods Forest Preserve. It has a surface area of 17 acres and a maximum depth of 8 to 9 feet.

The stream system consists of the main stem Little Calumet River flowing westerly along the northern boundary of the watershed and four major tributaries: Midlothian Creek, Calumet-Union Drainage Ditch, Thorn Creek, and Plum Creek.

The main stem is characterized by very flat gradients. Although this stream channel has been enlarged in past years, it is unable to carry the peak flows from its four major tributary streams. The Indiana portion of the Little Calumet River Watershed has been diverted eastward to Lake Michigan via Burns Ditch. Under extreme peak flood flow conditions, the Little Calumet in Illinois discharges flows via Burns Ditch to Lake Michigan.

Midlothian Creek is an intermittent stream from its source to the newly installed Twin Lakes Reservoir at 163rd Street. From Twin Lakes Reservoir downstream to its confluence with Little Calumet River, it is perennial. Channel modification and filling of natural flood plains is extensive throughout this tributary. The primary exceptions are forest preserve holdings southwest of Oak Forest and peat bogs within the Village of Tinley Park.

The Calumet-Union Drainage Ditch is an intermittent stream at its source. It is perennial at its confluence with the Little Calumet River. This tributary has three major sub-tributaries and a complex internal drainage system which has been strongly influenced by the installation of highways, major storm sewers, and artificial channels. Although some natural streambanks and flood plain areas exist in Homewood and Markham, virtually all channels and flood plains on this tributary have been modified. Urban development of this tributary is essentially complete.

Thorn Creek is the largest single sub-watershed to the Little Calumet River. Thorn Creek has three major tributaries (Butterfield Creek, Deer Creek, and North Creek) and is an intermittent stream from its source in Park Forest South to Sauk Trail Lake. From this point to its confluence with the Little Calumet River, it is a perennial stream. Although the stream channel has been modified upstream from the Village of Park Forest, the flood plain remains essentially in its natural condition. This is due to extensive public land ownership (forest preserves) and development constraints (deeply entrenched flood plain). Thorn Creek from its junction with North Creek to its confluence with Little Calumet River has some potential for recreation navigation except during extreme low flow periods. Approximately 65 percent of the Thorn Creek flood plain is currently in public control.

Butterfield Creek is an intermittent stream from its source in Matteson to Crawford Avenue. From this point, it is perennial to its confluence with Thorn Creek. Like Thorn Creek, channel modifications have been confined to the upstream areas. From Crawford Avenue downstream, both flood plain and channel are essentially in their natural configurations. However, public ownership of the flood plain on this stream is not widespread. Flood plains have not been encroached on due to their deeply entrenched nature and their extensive use as golf courses. Urban development is progressing very rapidly in Matteson and adjacent villages in the upstream areas.

Deer Creek is classified as intermittent from its source in Park Forest South to East Chicago Heights. From this point, it is classified as perennial to its confluence with Thorn Creek. Channel modifications have been made upstream of Deer Creek Lake. From this point to the New York Central Railroad tracks south of East Chicago Heights, the stream and its flood plain are essentially in their natural configuration. Channel modifications and flood plain encroachment have taken place through East Chicago Heights. This modification extends downstream to the point where the stream enters forest preserve district land. Here it continues essentially unmodified to its confluence with Thorn Creek. This tributary has not been significantly influenced by urban encroachment on its flood plain. The upstream watershed area in Park Forest South is being developed for urban use. In other villages along this tributary, urban development has not extended into the flood plain and therefore it remains predominantly in agricultural use.

North Creek (Lansing Ditch) is an intermittent stream from its source south of Sauk Village to U.S. Route 30. From here to its confluence with Thorn Creek, it is a perennial stream. Virtually all its channels have been modified; however, the flood plain from the Lansing city limits to the confluence with Thorn Creek still remains in a natural state. Between U.S. Route 30 and the Lansing city limits, urban development is progressing rapidly. These new developments plus the encroachments in Sauk Village and Lansing leave only those stream areas in forest preserves unmodified.

Plum Creek is an intermittent stream from its source north of Beecher to the Indiana state line. Virtually all of its channels and flood plains are in their natural state.

The Little Calumet River is a perennial stream throughout its entire course. Periodic dredging of the stream channel has resulted in modification of its entire length. Natural flood plain which once existed has been modified by urban development and associated land filling. This stream has an extremely flat streambed gradient. During abnormally high runoff from Thorn Creek, flow occasionally reverses and floodwater flows easterly into Indiana. Flow conditions in Indiana are such that most of the floodwaters that enter Indiana in this manner return through Illinois as increased base flow following these floods.

The Illinois Pollution Control Board adopted water quality standards designating the waters of the Little Calumet River for general use. (8) This means that the water is to be protected for aquatic life, agricultural use, primary and secondary contact use, most industrial uses, and insuring the aesthetic quality of the aquatic environment. However, at the present time water in the Little Calumet River does not meet these standards. The water contains unnatural sludge, bottom deposits, floating debris, unnatural color and turbidity, and at times emits offensive odors.

Debris and solid wastes discarded in and adjacent to streams create channel blockages and increase flooding problems. Such disposal of solid wastes in the streams produces unsightly environmental degradation.

Indiana Stream Pollution Control Board Regulation SPC-9 designates water quality criteria to be met by Little Calumet River flow into Illinois. This regulation is similar to the Illinois Standard.

The Environmental Resource Map at the rear of this report shows the location of stream water quality sampling points within the Little Calumet River Watershed. The Water Quality Data Table which follows shows the results of this sampling and analysis and the applicable standards.

WATER QUALITY STANDARDS

Little Calumet River Watershed

Illinois & Indiana

Data Source	Temp. °F	pH	BOD mg/l	Fecal Colif. per 100 ml	Total Phos. mg/l	NH_3 N mg/l	Turbid J.T.U.	Dissolved Oxygen mg/l	Total Suspended Solids mg/l
Illinois General Use Water Quality Standards	Varies	6.5 to 9.0	No Std.	200	0.05	1.5	No Std.	6.0	No Std.
Indiana Regulation SPC-9	90	6.5 to 9.0	10	5,000	No Std.	1.5	0	4.0	No Std.

WATER QUALITY DATA
Little Calumet River Watershed
Illinois & Indiana

Samp. 1/ Pt.#	Date (1973)	Temp °F	pH	BOD mg/l	Fecal Colif. per 100 ml	COD mg/l	Total Phos. mg/l	Ortho Phos. mg/l	Total N mg/l	NH_3 N mg/l	NO_3 N mg/l	Tur-bid-ity J.T.U.	D.O. mg/l	Total S.S. mg/l
1	5/8 thru 5/30	56	7.5	7	8,670	43	1.80	1.19	4.55	2.95	2.19	46	4.1	31
2	"	55	8.0	6	4,350	30	.12	< .02	.83	.15	1.37	49	7.5	34
3	"	52.5	7.5	8	34,554	41	1.10	0.62	3.13	1.34	2.12	47	3.4	37
4	"	53	7.6	10	6,714	45	3.08	2.51	7.73	5.27	2.37	46	4.9	72
5	"	52	7.8	5	23,253	27	0.25	< .02	1.19	0.26	2.51	96	8.0	88
6	"	55	7.7	13	2,277	46	2.09	1.72	6.09	3.64	2.77	78	5.9	41
7	"	53	7.7	9	11,288	39	1.89	1.48	7.84	5.51	3.83	108	7.9	63
8	"	54	8.0	7	7,340	35	.15	< .02	.79	.20	1.26	81	6.5	66
9	"	52	7.7	11	44,030	38	1.27	0.99	11.39	9.41	2.80	63	6.9	60
10	"	52	7.6	11	12,740	39	0.96	0.61	13.83	10.98	4.47	77	5.1	63
11	"	52	7.6	7	57,500	26	0.40	0.13	1.87	0.69	2.04	42	7.1	31
12	"	52	7.9	6	6,298	25	0.05	< .02	1.27	0.31	2.17	45	7.5	32

1/ Locations of sampling points are shown on the Environmental Resource Map.

The following descriptions and interpretations are excerpted directly from the Environmental Assessment, Little Calumet River Watershed which was prepared as part of this study.

Little Calumet River. The data collected indicate that in most reaches the Little Calumet River has very poor water quality. The high BOD and high nitrogen, particularly ammonia nitrogen concentrations, together with the low dissolved oxygen and the high fecal coliform counts found in the river are indicators of gross pollution, most of which comes from combined sewer overflows. Nutrients (phosphorous and nitrogen) have high enough concentrations to cause extreme algae blooms when high turbidity does not interfere with photosynthesis.

Thorn Creek. Water quality is poor in Thorn Creek's downstream half, especially below the Bloom Township Sewage Treatment Plant outfalls. The high BOD, COD, phosphorus, and nitrogen (especially ammonia nitrogen) concentrations, together with the relatively low dissolved oxygen seen in the data, are indicators of gross pollution with high nutrient enrichment. Most of these indices, especially phosphorus and nitrogen, are much lower in the upstream sections of the creek above the outfalls. Fecal coliform counts, however, are relatively high at all points along the stream, indicating some sewage contamination upstream as well. The water quality in the upstream reaches of Thorn Creek is fair, with adequate dissolved oxygen to support fish life.

Butterfield Creek. Water quality is poor. The high BOD, phosphorus and nitrogen concentrations are evidence of the heavy pollution load placed on this stream by the discharge of sewage effluent. Fecal coliform counts tend to be comparatively low. The stream is highly enriched with nutrients and the low dissolved oxygen and high ammonia nitrogen concentrations probably limit fish life.

Deer Creek. Water quality is poor. The relatively high BOD and high nitrogen, particularly ammonia nitrogen, concentrations, together with high fecal coliform counts, especially in the downstream sections of the creek, are indicators of the pollution caused by the discharge of sewage effluent. Phosphorus and nitrogen concentrations vary in the samples analyzed, but the creek should still be considered highly enriched. Dissolved oxygen was high in most samples and would be adequate to support fish life.

North Creek. Water quality is relatively good. BOD, phosphorus, and nitrogen concentrations are all low and there is a more than adequate supply of dissolved oxygen. The fecal coliform count is relatively high, however, which may indicate some form of sewage contamination along the creek. The turbidity in the creek is high as well, which may limit some forms of aquatic life.

Hart Ditch. Water quality is fair. The data collected show that the water has moderate concentrations of BOD, phosphorus, and nitrogen, and while the fecal coliform count is high, which may cause a health hazard, so is the dissolved oxygen, which may make the stream suitable for fish life. Extensive algae growth could take place with the proper conditions, but this is unlikely due to the physical characteristics of the stream.

Plum Creek. Water quality is fair. Plum Creek data exhibit many of the same qualities as the Hart Ditch data. There are low to moderate concentrations of BOD, phosphorus, and nitrogen, and a high dissolved oxygen concentration. The fecal coliform count is still moderately high, but not as bad as the counts seen in the Hart Ditch data.

The present condition of the streams demonstrates the results of decades of insults to the natural waterway. The upland watershed areas are generally silted because of poor erosion control, contain excessive bacteria from human and animal wastes, and flow intermittently due to drainage improvements and reduction of the high water table which formerly created springs throughout the basin. Sewage treatment plants proliferate along the streams, resulting in the classification of all of the lower reaches as a "health hazard". The Little Calumet River receives these pollutants and solids

from the tributary streams and, during storms, massive amounts of raw wastes from combined sewer outfalls along its length. The river is muddy and foul smelling and flows along banks lined with sludge and muck. As a result, the river is unsuitable for all but the most pollution-tolerant plant and animal life. Very little recreational use of the river or tributary streams is made over their 120-mile length.

The need for clear water has been established as a national, state, and regional goal and local support for improvement of water quality in the Little Calumet River has been demonstrated. It is projected, therefore, that future water quality throughout the study area will be sufficient to provide improved opportunities for using the streams. Where flow conditions are satisfactory, recreational use of the streams will be possible and streamside properties will be enhanced.

Projections to the year 2000 indicate a substantial increase in urbanization throughout the watershed. The resulting drainage improvements and further lowering of the water table will reduce the natural flow of some streams. Consolidation of sewage treatment into a few regional plants will reduce the flow in some streams which now receive effluent. These factors could result in dry creek beds during the late summer and early fall in several streams within the watershed.

Economic Data

Estimates of past and projected future population and employment for the watershed were aggregated from data supplied by the Northeastern Illinois Planning Commission (NIPC). (*3*) These data are as follows:

Year	Population	Employment		
		Manufacturing	Non-Manufacturing	Total
1965	363,200	32,670	42,390	85,060
1975	481,600	42,710	58,920	101,630
1985	603,000	45,000	88,760	133,760
1995	808,700	47,550	145,850	203,400

The watershed can be characterized as a large, very diverse, rapidly urbanizing area. An estimated 1,000 acres of land are being converted to urban uses each year.

Urbanized areas within the watershed vary greatly as to their relative affluence. This is best exemplified by data compiled by NIPC in 1971 concerning the socio-economic ranking of suburbs within the Chicago Metropolitan Area. A total of 200 suburbs within the metropolitan area have been assigned a composite numerical ranking based on median family income, percent of families with incomes exceeding $25,000, and the educational level of adults over 25 years of age with reference to the percentage of college graduates and median years of schooling.

Median family income for the metropolitan suburban area was $13,380 with 9.9 percent of families having an income in excess of $25,000. Median years of schooling for adults over 25 years old was 12.4 with 15.2 percent college graduates.

The composite rankings for suburbs within the watershed indicate the Villages of Olympia Fields and Flossmoor rank fourth and seventh, respectively, among all the metropolitan suburbs. At the other end of the spectrum; Phoenix, Robbins and East Chicago Heights rank 198th, 199th and 200th, respectively.

The rankings for the 34 suburbs located wholly or partially in the watershed area indicate 22 have median incomes less than the suburban median. Likewise, 28 of the watershed suburbs have a lesser percentage of families with incomes of $25,000 or more.

Nineteen of the 34 watershed suburbs have less median years of schooling than the suburban average. Likewise, 25 of the suburbs have a smaller percentage of college graduates. The preceding findings would indicate an overall socio-economic profile of slightly less affluence than that for the total metropolitan suburban area.

A large portion of the watershed working force now commutes out of the area either to downtown Chicago or to the steel and industrial complex in East Chicago, Gary, and Hammond, Indiana. Several local industries such as the Ford Motor Company stamping plant in Chicago Heights and the Illinois Central Railroad facilities in the Harvey-Markham area are also large employers.

Continued population growth has been and will continue to be accompanied by a build-up of light manufacturing and service industries. This will help in some part to relieve a relatively high rate of unemployment in villages such as Robbins and East Chicago Heights. Overall unemployment rates in the watershed do not appreciably exceed the overall rate of about 2.1 percent for the metropolitan suburban area as of mid-1974.

Local zoning ordinances and building codes vary greatly. Emphasis on single family residences has resulted in high value homes on relatively large lots in Flossmoor, Olympia Fields, and other prestigious residential areas. Home values in these areas are currently in the $70,000 to $100,000 range.

Park Forest, one of the few planned villages in the metropolitan area, is a model of mixed housing, i.e., single family dwellings, townhouses, and apartments. Current market values for homes range from about $40,000 to $70,000. Park Forest South is now being developed in a similar manner.

Home values (not including value of land) are currently in the $25,000 to $40,000 range in the Oak Forest, South Holland, and Lansing areas. Home values in the Harvey-Markham-Hazel Crest area are estimated to vary from $17,500 to $25,000. In the Robbins and East Chicago Heights areas, current home market values are estimated to vary from about $7,500 to $17,500.

Current values for undeveloped land in the watershed are generally lower than for corresponding property in the western and northern metropolitan suburban areas. Land values for single family residential developments range from $3,000 to $10,000 per acre. Land values for apartment, business, and industrial development range from $15,000 to $75,000 per acre.

The crescent shaped agricultural area, which extends along the southern perimeter of the watershed, is used for row crop (corn and soybeans) production and some truck crop farming. Land values for agricultural use are affected by speculation for potential development; however, most land marketed for farming purposes is now in the $1,000 to $1,500 per acre range.

Agricultural land use is projected to decline 37 percent by the year 2000. The remaining acreage, (36,700 acres) will insure continuance of viable cash grain type operations on the remaining farmland.

Fish and Wildlife Resources

Flood Plain Areas:

The main stem of the Little Calumet River flows through a heavily urbanized area and has little wildlife except for a short reach where it is bordered by Kickapoo Meadows and Calumet Woods Forest Preserves.

Midlothian Creek begins west of the Village of Tinley Park. From its source downstream to Tinley Park, it flows through cropland and housing developments. Streamside cover is chiefly herbaceous vegetation with scattered trees (mostly box elder and willow). This cover provides good habitat for songbirds and pheasants. The part of the creek running through Tinley Park is tree-lined. Between Central Avenue and Cicero Avenue, the stream passes through Yankee Woods Forest Preserve which provides songbird habitat. From this point to its mouth, Midlothian Creek flows through a highly urbanized area comprising the Villages of Oak Forest, Midlothian, Robbins and Dixmoor where it enters the Little Calumet River. This reach provides only limited wildlife habitat except where it borders Midlothian Meadows Forest Preserve, between Cicero Avenue and Crawford Avenue.

Butterfield Creek flows through Olympia Fields, Flossmoor, Chicago Heights, and Glenwood where it enters Thorn Creek. In Olympia Fields, it is about 10 feet wide with good streamside woody cover composed of box elder, cottonwood, and willow.

From Western Avenue in Flossmoor to Chicago Road, it flows through Flossmoor and Idlewild Country Clubs and a residential area. This reach has good streamside tree cover providing habitat for songbirds. At the State Highway 1 crossing, there is a wooded flood plain and an area of cropland.

Thorn Creek, from Thorn Creek Woods south of Park Forest in Will County to the Cook County line, has a continuous band of forest. This habitat is suitable for deer, furbearers, squirrels, songbirds, and other wildlife. From this point downstream to the interchange between Calumet and Kingery Expressways, the creek flows through the Thorn Creek division of the Cook County Forest Preserve. This area has a variety of wooded and open habitats. Outstanding or unusual vegetation includes bur oak and white oak of large size, Ohio buckeye, sassafras, black gum, native orchids, lupines and ferns.

Deer Creek has been dammed about one mile south of the Will-Cook County line to form Deer Lake. Upstream of the lake the creek flows through a marshy area bordered by abandoned land which has been invaded by shrubs and trees, notably sumac, hawthorn, and crabapple. This is excellent habitat suitable for a variety of wildlife. At the 14th Street crossing at the east edge of East Chicago Heights, there is tree cover on both banks of the stream. One mile farther north at Joe Orr Road, the stream is tree-lined and is bordered by cropland. Deer Creek joins Thorn Creek at the south edge of Glenwood in the Glenwood Woods Forest Preserve. There is good woody habitat here.

Plum Creek flows through an 80-acre tract of Will County Forest Preserve land east of Goodenow at the junction of Highways 1 and 324. Most of the creek to the Indiana state line is wooded and much of it is bordered by steep bluffs. The wooded areas are predominantly mature oak forest and are good to excellent habitat but they are being encroached upon by housing development.

Stream Habitat and Fisheries:

A considerable amount of information is available about stream fish habitat in the Cook County portion of the watershed, but none is available for Will County streams. The following data are excerpted from 1967-1973 reports submitted by Harry Wight, Fishery Biologist, Illinois Department of Conservation. In the case of

Calumet-Union Channel, Butterfield Creek, Third Creek, Deer Creek, and Little Calumet River, Mr. Wight's reports are quoted directly.

Calumet-Union Drainage Canal - "This man-made ditch has a large industrial watershed with one small tributary draining a large railroad yard. Large storm sewers, oil films, and black muck were conspicuous during the September 1970 inspection. The stream is primarily made up of long flats with slow flow and averages 1 foot in depth. Bottom type is primarily muck with silty gravel where scoured. Emergent vegetation, the only type observed, was scarce. Most of the banks are well mowed with little stream cover present. Although its maximum width is 15 feet, it averages 8 feet. The 1970 fish collection included green sunfish, fathead minnows, sunfish, and a few largemouth bass. This collection was made after a recent heavy rain which would explain the presence of the bass from upstream impoundments. The stream receives no present recreational usage."

Butterfield Creek - "This stream has a watershed composed of urban and agricultural drainage. The lower watershed has many homes, while the upper was still in row crops as of November 1969. The banks of this stream are heavily wooded. The water color is murky gray with septic odors in mucky areas. The lower part of the creek is silt laden while the remainder meanders with a gravel-rubble bottom and pool-riffle effect. The stream averages 15 feet in width and 1.5 feet in depth. Fish collection includes: fathead minnow, creek chub, golden shiner, black bullhead, green sunfish, Johnny darters, and largemouth bass."

Third Creek - "This very small tributary to Thorn Creek has never been sampled, but gross observation indicates an industrial watershed, rubble bottom, and the presence of oil slicks."

Deer Creek - "Much of this naturally meandering stream runs through heavily wooded forest preserve property. Pool and riffle development is conspicous. Bottom type is gravel silt with undercut banks common. Water color is brownish green which would indicate silt and fertilization in the watershed. Average width is 8 feet and average depth is 1.5 feet. A 1969 fish collection included: creek chubs, green sunfish, fathead minnows, and goldfish."

Midlothian Creek - "The stream bottom is predominantly silt with some gravel in riffles. Silt load is heavy and pollution is evident. There is no fishing because of the lack of game species of fish. The stream receives storm water drainage and sewage pollution. Fish collected at the 167th Street bridge on September 3, 1970 were black bullheads, green sunfish, white suckers, and creek chubs."

Thorn Creek -"This stream flows through a highly urbanized area. About 80 percent of its length in Cook County is in Cook County Forest Preserve ownership. Although it has a rocky bottom and riffle-pool configuration typical of a smallmouth bass-rock bass stream, poor water quality and urban expansion limit recreation potential and prevent establishment of game fish populations. Some fishing is done by children for bullheads and goldfish. The only fish taken in collections on June 30, 1967 were goldfish and creek chubs."

North Creek -"This small stream is a tributary entering Thorn Creek in Sweet Woods Forest Preserve. Much of the watershed is in forest preserve ownership and no pollution has been reported. However, pollution in Thorn Creek prevents upstream migration of desirable fish species. Fish collected on July 12, 1967 were carp, creek chubs, green sunfish, golden shiners, silver jaw shiners, and some unidentified minnow species."

Little Calumet River - "Within the past five years, the Little Calumet River has been sampled by Fisheries personnel three times in 1967, 1969, and 1971. During the last two samplings, the same three stations were sampled to try to assess any change in the aquatic life between these periods. No observable improvement in the aquatic life could be noticed."

"The Little Calumet River still has an aquatic habitat unsuitable to sustain a desirable fish population. What few fish do survive are low oxygen tolerant species or species that have somehow managed to acclimate to polluted stream conditions. Surprisedly collections have come up with quite a number of species: carp, goldfish, green sunfish, pumpkinseed sunfish, yellow perch, orange-spot sunfish, bluegill, bluntnose minnow, golden shiner, mudminnow, white sucker, alewife, creek chubs, black bullhead, largemouth bass; but most of the fish collected were in localized areas near creek mouths or other effluents of water with a higher water quality. Much of the river is without fish life or has only carp and goldfish."

"The plant community consists mainly of emergent smartweed, cattail, bulrush, water willow along banks and submergent sago pondweed and elodea rooted in sludge beds. Filamentous algae abounds in certain 'quiet water' stretches of the streams. Clean water, hard bottom, streams would probably not have this abundance of submerged vegetation."

"The marked presence of bloodworms literally lining the banks in some sections of the stream, certainly indicates the highly organic waste load that this stream carries. No other aquatic insects or crustacea have been observed in the river."

Mr. Wight stated further that most dissolved oxygen readings in the Little Calumet fall between 0.8 ppm and 2.5 ppm which are below tolerance levels of desirable fish species and most normal stream insects.

Lake and Pond Habitat and Fisheries:

A total of 46 lakes and ponds equal to or greater than 5 surface acres are in existence. Two (unnamed) 5-acre lakes are considered to provide good wildlife habitat. Ten lakes (total surface area - 147 acres) are used for fishing. Wampum Lake and Sauk Lake are most notable. Wampum Lake was recently rehabilitated by the Illinois Division of Fisheries and reopened to fishing in the fall of 1973. Sauk Lake contains only bullheads, carp, sunfish, and goldfish and is considered unmanageable for game fish.

Nature Preserves and Natural Areas:

Jurgensen Woods North Nature Preserve is located in Section 2, T35N, R14E and is owned by the Cook County Forest Preserve District. It was dedicated as a part of the Illinois Nature Preserve System on January 5, 1965. It has a wide variety of plant life including such uncommon species for the area as black gum, purple chokeberry, cinnamon fern, and low blueberry. Part of the area is a mesic-to-wet oak forest and part is a thicket of chokeberry, aspen, ash, and buckthorn.

Thornton-Lansing Road Zanders Woods Nature Preserve includes 440 acres and is located in Sections 34 and 35, T36N, R14E. It is owned by the Cook County Forest Preserve District and was dedicated as a nature preserve on January 5, 1965. Vegetation includes mesic oak woods, scrubby black oak woods (on sand), cattail-bulrush marsh, and a wet, sandy, prairie-like community. The preserve has some rare and unusual shrubs and wildflowers including sassafras, sweet-fern, and lupine.

Thorn Creek Woods located in Northeastern Will County, has been recommended by the Illinois Nature Preserves Commission for acquisition as a nature preserve and recreation area. Of the total 952 acres, 351 are considered suitable for use as a nature preserve. The description which follows was taken from "Report on Thorn Creek Woods Will County to the House of Representatives of the 77th General Assembly by the Illinois Nature Preserves Commission," dated April 15, 1971.

The area is bounded on the north by the Village of Park Forest and on the west by the campus of Governors State University. It lies between Western Avenue and Monee Road. Thorn Creek Woods is an oak forest in the upper reaches of Thorn Creek Watershed. The upland forest is dominated by white oak, red oak, and bur oak with scattered blackcherry, swamp white oak, and shagbark hickory. Ravine forests are red oak, basswood, sugar maple, and black maple. Hop hornbeam is common on dry steep slopes. Walnut, swamp white oak, red oak, ash, and elm occur on the flood plain. The shrub layer in upland sites is dominated by viburnums and hawthorns. The herbaceous flora includes hepatica, blue phlox, spring beauties, and other wildflowers.

Markham-Gensburg Prairie is located in Cook County, Section 13, T36N, R13E. This prairie area contains about 120 acres. The Nature Conservancy owns 60 acres and is initiating acquisition of an additional 53 acres. The entire prairie qualified for dedication as a nature preserve.

Wetlands:

A total of 26 wetland areas (405 acres) have been identified. These wetland areas furnish food and cover for deer, pheasants, furbearers, waterfowl, songbirds, shorebirds, and wading birds. The three Type 4 inland deep fresh marshes are the largest (205 acres) wetland areas and have the greatest potential for preservation as open space and wildlife habitat.

Wildlife:

Seventeen species of amphibians, 27 species of reptiles, 97 species of birds, and 41 species of mammals are known or likely to be found in the watershed. (A listing of these species of amphibians, reptiles, birds, and mammals and their preferred habitats has been prepared and filed with the supporting data for this report.)

Waterfowl using migration corridors that pass through the area include 600,000 mallards; 35,000 baldpates; 25,000 pintails; 100,000 black ducks; 280,000 scaup; 117,000 ring-necked ducks; 160,000 Canada geese; and 9,000 snow geese. Pheasants, furbearers, waterfowl, songbirds, shorebirds, and wading birds are the most common wildlife species in existence. (*13*)

Six species of birds considered to be rare or endangered in Illinois are found in the watershed. The watershed is in the range of and contains habitat important to four species of amphibians and reptiles rare in Illinois. These animals are listed as follows in the Inventory of Fish and Wildlife Resources of the Little Calumet River Watershed with their status in Illinois and preferred habitats:

Black-crowned night heron - Nycticorax nycticorax - rare - marshes and woods.

Red-shouldered hawk - Buteo lineatus - endangered - marshes, woods, farms, and orchards.

Marsh hawk -- Circus cyaneus hudsonius - rare - marshes, open fields, meadows, thickets, and hedgerows.

Barn owl - Tyto alba - endangered - open fields, meadows and pastures.

American bittern - Botaurus lontiginosus - rare - ponds, sloughs and marshes (not wooded).

Brewer's blackbird - Euphagus syanocephalus - rare - open fields, meadows and pastures.

Blue-spotted salamander - Ambystoma laterale - rare - swamps (wet, wooded land).

Four-toed salamander - Hemidactylium scutatum - rare - bogs.

Eastern woodfrog - Rana sylvatica - rare - woods.

Western slender glass lizard - Ophisaurus attenuatus - rare - open fields, meadows and pastures.

Recreational Resources

Recreational resources within the watershed consist of approximately 13,200 acres of forest preserve land, 380 acres of local park district, and 10 private golf courses.

All golf courses are private with access limited to members and guests. The forest preserve district land and park district lands have unlimited public access. Much of this land is limited to a few activities such as hiking and picnicking.

Some streams provide recreational resources particularly in the lower reaches. The Little Calumet main and the lower reaches of Thorn, Deer, North, and Butterfield Creeks provide canoeing and boating. Stream fishing is practically nonexistent.

There is public access to some 30 miles of a total 109 miles of stream in the study area. The primary recreation use of the streams is for canoeing and boating.

A few small reservoirs formed by removal of borrow material for highway construction provide limited recreation to private developments. Wampum Lake and Sauk Lake owned by the Cook County Forest Preserve District provide some limited fishing.

Utilization of recreational resources in the watershed is unusually high. Use is influenced by the demand of the population within the watershed and the population adjacent to the watershed within one-half hour travel time. These two categories encompass some 2.1 million people. Present recreation use of the forest preserves within the watershed is approximately 3.9 million visitors per year.

Hunting is of minor importance. There are a few private clubs primarily for skeet and trap shooting.

The southwestern shore of Lake Michigan parallels the northeastern boundary of the watershed. The lake front in this area is primarily an industrial complex. Public access is extremely limited. Lake Michigan provides very little recreation for the residents of the Little Calumet River Watershed.

Archaeological and Historical Values and Unique Scenic Areas

The Little Calumet River Basin is an important archaeological area for data from the later prehistoric period. Several important specific sites are known and there is a strong conviction among authorities that a great many important unexplored sites exist. Because of possible abuses, it is the policy of the Illinois Archaeological Survey that the locations of known sites are not made available to the public. As a part of this study, a detailed survey was made of each potential structure site area.

No places of historical interest in the watershed have been accepted for inclusion in the National Register of Historic Places. Four sites of historical significance are identified in the Environmental Assessment of the Little Calumet River Watershed. These are as follows:

H1 Sec. 15, T36N, R13E. Portions of a Civil War-era powder mill allegedly remain on the forest preserve land in this vicinity.

H2 Sec. 25, T36N, R14E. The South Holland Historical Society occupies the Paarlberg Home Museum near 170th Street and Paxton Street. This former farm house is over 100 years old.

H3 Sec. 31, T35N, R14E. The pioneer homesite of John McCoy, soldier in the Revolutionary War and later a station on the underground railroad for escaped slaves. Maintained by the Cook County Forest Preserve District.

H4 Sec. 20, T35N, R14E. Site of the cabin of Absalom Wells, the first white settler in this part of Cook County. Maintained by the Cook County Forest Preserve District.

Areas of natural beauty identified in the Environmental Assessment of the Little Calumet River Watershed are described as follows:

P1 Markham-Gensburg Prairie (approximately 120 acres). Sec. 13, T36N, R13E. Sixty acres of this fine prairie was donated to the Nature Conservancy. The Nature Conservancy is initiating acquisition of an additional 53 acres. The area includes mesic and sandy prairie with some wet prairie. It is relatively undisturbed and contains a great number of prairie species. The entire area qualifies for dedication as a nature preserve.

P2 Calumet Slough, Sec. 6, T36N, R14E. A small area consisting of relatively undisturbed flood plain woods. A lack of open space in the vicinity makes such a site particularly valuable in its natural state.

P3 Sand Ridge Nature Center. Sec. 13, T36N, R14E. Examples of a variety of natural vegetation and wildlife habitats maintained by the Cook County Forest Preserve.

P4 Sand Ridge Prairie (approximately 60 acres - not in study area). Sec. 18, T36N, R14E. This large prairie is contiguous with Sand Ridge Nature Preserve, east of the Penn Central Railroad. It is of similar quality and would be a valuable addition to the nature preserve.

P5 Jurgensen Woods North Nature Preserve and Thornton-Lansing Road Zanders Woods Nature Preserve. Sec. 2, T35N, R14E and Secs. 34, 35, T35N, R14E. Both of these preserves, which are owned by the Cook County Forest Preserve District, have a wide variety of plant life, including oak forest and uncommon species of trees, shrubs and wildflowers.

P6 Sec. 14, T36N, R14E. This is a stand of hardwood trees along the Little Calumet River.

P7 Sec. 24, T36N, R14E. This is a stand of hardwood trees near the confluence of Thorn Creek and the Little Calumet River.

P8 The Homewood Spit. Sec. 32, T36N, R14E. This is the last undeveloped area in a fossil sand dune. It also contains some native prairie species.

P9 Cherry Creek. Sec. 36, T36N, R13E. This is an area of wooded flood plain near Homewood.

P10 Sec. 23, T35N, R13E. This is a wooded area along Butterfield Creek near Olympia Fields.

P11 Thorn Creek Woods (952 acres). Secs. 1, 2, 11, and 12, T34N, R13E. The Illinois Nature Preserves Commission has recommended the acquisition of this area as a nature preserve and recreation area. Thorn Creek Woods is an oak forest in the upper reaches of Thorn Creek Watershed. The upland forest is dominated by white oak, red oak, and bur oak with scattered black cherry, swamp white oak, and shagbark hickory. Ravine forests are red oak, basswood, sugar maple, and black maple. Hop hornbeam is common on dry steep slopes. Walnut, swamp white oak, red oak, ash, and elm occur on the flood plain. The shrub layer in upland sites is dominated by viburnums and hawthorns. The herbaceous flora includes hepatica, blue phlox, spring beauties, and other wildflowers. A wide variety of birds and mammals inhabit Thorn Creek Woods.

P12 Sec. 3, T34N, R13E. There are stretches of native prairie vegetation along the Illinois Central Railroad tracks between Governors State University and Richton Park.

P13 Deer Creek Woods (23 acres). Sec. 13, T34N, R13E. This is a 3-acre grove of mature oaks and a 15-acre grove of conifer and mature oaks that lie within the village limits of Park Forest South.

P14 Secs. 8 and 17, T34N, R14E. About 160 acres have been used extensively as a field laboratory by students at Governors State University. Native prairie grasses and prairie flowers are located on the site.

P15 Sec. 33, T34N, R14E and vicinity. The upper watershed area of Plum Creek contains sections of woodland which provide increasingly valuable wildlife habitat. This area is one of the last known ranges in the Little Calumet Basin of the Massasauga rattlesnake and Kirtland's water snake.

P16 Sec. 18, T34N, R15E. The area where Klemme Creek crosses Klemme Road is an unusually scenic point. The creek flows through a rolling pasture and a small grove of oak trees.

P17 Sec. 7, T34N, R15E and vicinity. The rolling, wooded hills along Plum Creek in this area are very scenic and provide a valuable wildlife habitat.

P18 Secs. 3 and 4, T35N, R9W. This area is recognized as containing valuable prairie with many species of native vegetation.

P19 Secs. 29 and 32, T36N, R15E. A 15-acre farm stretches along the state line in a heavily urbanized area.

P20 Sec. 10, T34N, R13E. An area on property owned by Governors State University, known as the Sztuba parcel, contains many species of prairie plants.

Unique Geological Areas

Areas of geological interest identified in the Environmental Assessment of the Little Calumet River Watershed are described as follows:

G-1 Area within Secs. 10 and 11, T36N, R13E. An area where the Niagaran series of undifferentiated dolomitic limestone formations is exposed. This is a heavily urbanized area, but the exposed rock may be of interest within small parks.

G-2 NW 1/4 of NW 1/4, Sec. 1, T36N, R13E. An area where the Niagaran series of undifferentiated dolomitic limestone formations is exposed. Although in an urbanized area, there is an area surrounding two water impoundments which could be enhanced for recreation and possibly fossil hunting.

G-3 Sec. 10, T35N, R13E. Several hundred acres of sand and silt from a deltaic deposit in a glacial lake. One of only a few such sites in the Chicago area.

G-4 Sec. 22, 23, T35N, R14E. A large portion of East Chicago Heights is on exposed or thinly covered Niagaran series of undifferentiated dolomitic limestone formations. An area west of Cottage Grove Avenue was quarried for a short time and may be ideal for fossil hunting.

G-5 Sec. 26, T35N, R14E and Sec. 4, T35N, R14E. These are areas along Deer Creek and Thorn Creek where the Niagaran series of undifferentiated dolomitic limestone formations is exposed. The sites may be well suited for recreation and fossil hunting.

G-6 Sec. 35, T36N, R13E and Sec. 2, T35N, R13E. These are two areas which were designated as having a potential for artificial groundwater recharge in conjunction with flood control on the Calumet-Union Drainage Canal.

G-7 Sec. 31, T35N, R14E. The Thorn Creek Valley north of Sauk Trail Lake has been identified as the area in the Chicago Heights-Park Forest vicinity most geologically favorable for artificial groundwater recharge through pits.

Land, Water and Plant Management Status

Urbanization is occuring at a rapid rate in the watershed. Approximately 1,000 acres of forest, agricultural, and idle land are being converted to urban uses each year. Projections indicate that this trend will continue through the year 2000. Forest land is expected to decrease by 25 percent by the year 2000.

Forest preserve districts, park districts, and municipalities are acquiring agricultural, forest, and idle land for public open space and recreation as funds become available. Projections of the Northeastern Illinois Planning Commission indicate an additional 59,300 acres of open space will be needed in Will and Cook Counties by 1976. (*10*)

Activities of the Will and South Cook County Soil and Water Conservation District within this watershed are essentially limited to natural resource reviews on parcels of land where zoning changes have been requested. Probable impacts on water and related land resources are provided to the unit of government responsible for the zoning change. The local District also provides services including soil interpretations, resource conservation planning, and technical assistance, including engineering and design of conservation measures.

Municipal and county governments through their zoning, and subdivision building permit ordinances control methods of construction and development. However, there are few comprehensive sediment and erosion control ordinances which prescribe methods of construction which effectively control erosion and sedimentation.

Forest Preserve Districts have an excellent program of plant management on their lands. Management includes the removal of diseased, damaged, and mature trees. The Cook County Forest Preserve District has reforested 65 acres in the past five years. The Districts cooperate with individuals and other agencies in plant research and management.

Most of the undeveloped land is owned by investors. The land is being held for potential urban development. Operators who farm this land generally operate with one year leases. They do not apply extensive erosion control practices.

Inadequately treated wastewater enters most streams in the study area. Plans for regional wastewater management have been prepared by the Northeastern Illinois Planning Commission, the Chicago District of the Corps of Engineers, and the Metropolitan Sanitary District of Greater Chicago. The Regional Wastewater Plan developed by the Northeastern Illinois Planning Commission is an element of the Comprehensive General Plan for Northeastern Illinois. (*9*) It was adopted by the Commission on March 3, 1971. The objectives of the Corps of Engineers, Chicago South-End of Lake Michigan Regional Wastewater Management Studies were to identify a variety of potential regional wastewater management systems capable of achieving the water quality goals set by the Congress of the United States. (*15*) These goals include no discharge of critical pollutants consistent with the maximum removal capabilities of existing technology. The results identify the economic, environmental, social and national implications of such a policy. MSDGC's Tunnel and Reservoir Plan is a solution to the problem of combined sewer overflows. It appears that it will take 10 to 20 years to implement adequate solutions for wastewater management.

WATER RELATED LAND RESOURCE PROBLEMS AND NEEDS

Floodwater Damage

Floodwater damages are estimated to average $3,134,000 annually. Inundation of residential property, the principal floodwater damage, varies in magnitude from flooding of streets and lawns to major damage caused by flooding the basements and first floors of buildings.

Damages to 6,950 existing homes and other residential properties are projected to average $2,469,500 annually. Damages to individual homes and contents vary greatly depending on the depth of flooding and type of house construction.

Residential floodwater damage occurs frequently throughout most of the watershed. This is illustrated by the following table which shows the extent and magnitude of residential flooding for the projected condition 2-, 5-, 10-, 25-, and 100-year frequency floods for the Little Calumet main channel flood plain area.

Frequency Interval	Homes Flooded	Estimated Damages
100-year	6,950	$59,048,700
25-year	4,670	15,931,700
10-year	781	4,317,400
5-year	198	740,900
2-year	17	223,400
Average Annual		$ 2,469,500

About 66 percent ($1,641,200) of the projected average annual damage to residential property occurs on the intensively developed flood plain of the main stem of the Little Calumet River. An estimated 4,392 residences are subject to damage in this area.

Flooding on the Calumet-Union Drainage Ditch tributary is projected to cause average annual damages of $467,800 to 1,565 existing homes. Nearly 80 percent of this damage ($361,500) results from inundation of the area north of 159th Street to 151st Street east of Western Avenue.

Other major areas of flooding are on the North Creek and Midlothian Creek tributaries. A total of 679 existing homes will sustain average annual damages of $179,700 in the Midlothian Creek area. A total of 106 existing homes will sustain average annual damages of $166,000 on the North Creek flood plain.

Relatively minor damages occur on the Butterfield Creek, Deer Creek, and Thorn Creek tributaries. Total projected average annual damage to 207 existing homes in these areas is $14,800.

Damages to 142 existing business places are projected to average $43,500 annually. Most business places are located higher than the projected condition 100-year frequency flood profile. Also many business buildings do not have basements; these two factors limit the frequency of damaging flooding.

Traffic disruption is the second most important type of floodwater damage. Damages consist of additional costs incurred because of delays in travel by commuters, travelers, and vehicles providing services in the area. Future damages from disruption of traffic on major highways (7,400 disruptions annually) are estimated to average $98,700 annually.

Associated damages are estimated to average $522,300 annually. Damages consist of both private and public costs incurred because of flooding. An example of private costs include income foregone when workers are unable to reach their place of employment as a result of traffic disruption on arterial streets and roads. Likewise, individual homeowners incur expenses for sump pump operations, motel rentals, and meals in the event their homes are made uninhabitable. Other associated damages include flooding of residential streets, lawns, and gardens.

Associated damages to the public sector include additional costs for traffic direction necessitated by traffic disruption on major streets and roads. Flooding aggravates problems of channel maintenance and makes necessary the removal of debris from waterways following flooding. Disposal of debris is very costly. Costs for debris disposal in the metropolitan area are estimated to range from $0.90 to $1.25 per cubic yard at the present time.

Polluted floodwater causes public health hazards. Intensively developed residential areas that are inundated for prolonged periods by floodwaters polluted from combined sewer overflow, other urban runoff and agricultural pollutants are subject to serious health hazards.

Storage of floodwaters in depressional undeveloped areas increases the problems of mosquito infestation and attendant health hazards. Several mosquito abatement districts in the watershed area monitor and spray these problem areas following flood events.

Frequent residential flooding causes neighborhood degradation, a reduced quality and quantity of usable living space, and reduced structure life. Confidence in the individual neighborhood's future, on the part of both residents and financial institutions, is lessened. This often results in (1) the delay of needed repairs and/or improvements and/or (2) sale of homes at depressed values to "transfer" the flooding problem to an unsuspecting buyer.

Estimates of future average annual damages are based on the assumption that no new development will be constructed subject to a flood hazard. Flood plain regulations are assumed to control future development to avoid significant damage. However, for the most part these regulations are not yet in effect throughout the watershed. A need exists for ordinances to (1) regulate development in the flood plain, (2) prescribe compensatory storage for flood plain filling, and (3) preserve floodways to reduce damage to existing and future developments.

Evaluations of flood damages in this study have been limited to damages caused by overbank stream flooding. Sanitary sewer backup occurs during periods of intensive rainfall and prolonged duration flooding causing damage to many home basements. Sewer backup results from seepage into inadequately sealed sewer systems, and the pumping of downspouts and foundation drains into the sanitary sewer system.

The problem of sanitary sewer backup is a separate problem not always related to overbank flooding. However, alleviation of the problem in some areas cannot be insured without first reducing the overbank flooding problem.

A general lack of coordination between governmental entities in improvement and maintenance of stream channels has tended to amplify flooding problems. An example of this is upstream channel enlargement or storm sewer construction which,although reducing local flooding, increases downstream flooding.

Development of upland areas with uncontrolled storm drainage discharges is one of the most significant factors causing increased runoff and greatly increased flood flows. Flood plain filling and subsequent development have reduced flood plain storage and obstructed conveyance of flood flows. Development, in both the upland and flood plain areas, if uncontrolled, will increase the frequency and depth of flooding thereby increasing flood damages on existing structures.

Excessive Runoff and Erosion

Major problems are: (1) excessive erosion on crop and idle land, (2) excessive erosion on lands undergoing urbanization, and (3) urban development on soils with water management problems.

Average erosion rates for cropland and idle land within the watershed are 8.4 tons per acre per year. The major portion of this erosion is occurring along the southern rim of the study area from Monee to the Illinois/Indiana state line. Common farming practices presently include extensive row cropping and fall plowing. Contour plowing and conservation tillage are seldom used.

Operators who farm the agricultural land generally operate with one-year leases. This limits their economic ability to apply needed land treatment measures. Owners are reluctant to apply land treatment measures because much of the land is being held as potential for urban development and not for long-term agricultural production.

Lands under development are often left without vegetative cover for long periods (up to two years). This results in excessive runoff, and erosion on land being converted to urban uses.

Municipalities are not making full use of resource information when developing master plans and issuing building permits. The use of resource information including soils interpretation is needed to assure proper land use and treatment.

Erosion Damage

Sheet and rill erosion occur intensively around the southern rim of the watershed from Monee to the Illinois/Indiana state line on cropland and idle land. There are approximately 30,000 acres of cropland and idle land in this portion of the watershed. The table below shows erosion rates and approximate acres within each erosion category:

Erosion Rates (T/AC/YR)	0-3	3-8	8-12	12+
Acres	6,100	8,200	13,100	3,000

Excessive erosion occurs at most construction sites resulting in off-site sediment damages. Approximately 1,000 acres of land are being converted to urban uses each year. During any period of time approximately 2,000 acres are exposed to erosion since construction normally requires 2 years. The average gross erosion from construction sites within the watershed is approximately 24 tons per acre per year with ranges from almost no erosion to greater than 100 tons per acre per year.

Estimated rates of erosion from forest land is 0.7 tons per acre per year. Heavily impacted recreation sites have slightly higher rates as soils are compacted and ground cover is reduced. Such areas are very small in relation to the entire forest area.

Sediment Damage

Major sediment problems are related to present and future land utilization and management. Sediment concentration in runoff water adversely affects utilization of the water and adjacent land. Sediment deposition on the flood plain is not a significant problem.

The three major sources of sediment are: (1) erosion from cropland and idle land, (2) erosion from construction sites, and (3) urban storm water runoff. Of the sediment transported by the Little Calumet River at its outlet, it is estimated that 54 percent comes from agricultural, idle, and forest land; forty percent comes from urban storm water runoff; and six percent comes from construction sites.

Sediment from construction sites (about 11 tons/acre annually) obstructs storm drains and deposits on streets. This type of damage occurs primarily within the area of construction and on areas immediately adjacent to construction sites. Costly maintenance is required to correct such problems.

Sediment from agricultural land obstructs storm drains, drainage ditches, and road culverts, and increases the suspended sediment in streams. Much of this damage occurs very near to intensively cropped land.

Average suspended solid concentrations vary from 72 parts per million in the lower reaches of Thorn Creek to 31 parts per million in the Little Calumet main and the upper reaches of Plum Creek. These concentrations severely limit utilization of streams for many recreational and aesthetic purposes.

Sediment accumulation in stream channels is a problem. Sedimentation causes some losses in channel capacities primarily in the upper reaches of streams with extremely flat gradients and along the main stem of the Little Calumet River. Periodic sediment removal is required for some streams and drainage ditches.

The estimated average annual sediment yield at the watershed outlet is currently 242,000 tons per year. Most of this sediment is deposited in the Calumet-Sag Channel and other downstream navigation channels.

Recreation Needs

Present water related recreation demand is estimated at 145,000,000 user-days annually. Year 2000 water related recreation demand is projected to be 203,000,000 user-days annually. Demand is presently 70 percent unsatisfied and is projected to increase to 75 percent unsatisfied at the year 2000. (*14*)

Population in the Chicago Metropolitan Area is approximately 6.9 million with a projected population of 10.2 million by the year 2000. Approximately 30 percent of this population is within one-half hour commuting distance of the watershed.

Within the area of influence of the watershed, resources are not adequate to meet recreation demands. There is a need for additional water related recreational facilities for residents within and immediately adjacent to the watershed. The need exists for all kinds of recreational facilities.

Poor water quality severely limits the recreation potential of the Little Calumet River and its tributaries. Supplemental flow during low flow periods to improve the quality of the water and to increase the quantity is needed to restore and maintain recreational use of many of the streams. Projections indicate that the flow during low flow periods will decrease as more of the upstream areas are urbanized.

Forest preserves and local parks represent significant resources and are available for public uses. Golf courses and other recreational developments are not available to the general public except through membership.

Local park districts own approximately 380 acres of land in the watershed which is used for recreation purposes. The primary interest at this time is to develop land and related water which is already owned by park districts.

Because of inaccessibility, Lake Michigan supplies little water-related recreation to watershed residents. Lake Michigan also does not provide calm or "quiet" water recreation opportunities.

Public access for lake and stream fishing is limited. Only two impoundments are open to public fishing. Stream fishing is practically non-existent due to pollution. Opportunities for hunting still exist (doves, pheasants, quail, squirrels, and rabbits) but are diminishing rapidly. It is unlikely that hunting will continue to be an important form of outdoor recreation.

Public Open Space Needs

The Northeastern Illinois Planning Commission's projections indicate that an additional 1,200 acres of public open space will be acquired by the year 2000. This will supply part of the regional open space needs for the entire metropolitan area. Approximately 13,600 acres of land are presently dedicated to public open space in the study area. (*4*)

Projections indicate that there will be a shortage of approximately 47,700 acres of open space in Cook County and approximately 11,600 acres of open space in Will County by 1976. (*10*) Forest preserve districts, local park districts, and other units of government are obtaining land for open space as funds permit.

Approximately 17 percent of the existing public open space is being used for intensive recreation purposes. The remainder is not intensively used primarily because it has not been developed for intensive recreation purposes. Some of the remainder will be maintained to preserve its natural environment.

Irrigation Needs

The need for agricultural field crop irrigation is negligible in this watershed. Nurseries and golf courses have a limited need for irrigation water. Sources of irrigation water supply are tributaries of the Little Calumet River and wells. There is sufficient quality and quantity from these sources to meet the projected needs.

Municipal and Industrial Water Needs

About 60 percent of the current water usage in the Little Calumet River Study Area is supplied from Lake Michigan via the City of Chicago water supply system. Villages north of 183rd Street and east of Crawford Avenue presently receive over 90 percent of this lake water. As population concentrations move south and west, the demands for additional water will likely be met from Lake Michigan and/or accelerated mining of ground water.

Villages wholly or partly within the watershed use a total of 65 million gallons per day or an average of 130 gallons per capita per day. Although the per capita use is expected to remain relatively constant until the year 2000, the total municipal and industrial water demand will increase to 105 million gallons per day. The largest portion of this demand could be met through increased ground water mining, but ground water quality will worsen and eventual depletion will occur. The Illinois State Water Survey projects that spot shortages will occur by the year 2000. (*12*)

Impaired Drainage

Subsurface drainage of the soils in the watershed is generally adequate for agriculture. However, topography and soil conditions produce a high water table during most times of the year causing severe limitations on basement and other underground construction. This means that subsurface drainage systems are necessary for all underground construction. In many areas, stream channels and drainage ditches are not low enough or adequate to provide a gravity outlet for subsurface drainage. Therefore, pumped drainage from foundation drains is necessary.

Further complicating the drainage problem is the undesirable practice of outletting pumped foundation drains into the sanitary sewer system. During periods of heavy rainfall, when surface water is ponded or during periods of overbank flooding from major stream channels, these foundation drainage systems operate at near capacity. An average pump capacity for a foundation drainage system is 30 gallons per minute. The addition of this water into the system severely overloads sanitary sewers causing back up into homes with the lowest gravity inflow. The Metropolitan Sanitary District and local villages and sanitary districts are attempting to restrict the connection of foundation drains into the sanitary sewer systems. Building codes now prohibit these connections in most areas. However, older connections present a major problem.

Acute storm drainage problems exist in Markham, Posen, Midlothian, and Harvey. These areas have extremely flat topography, and until recent years suitable drainage outlets have been inaccessible.

Installation of a major 10-foot diameter conduit during Interstate 57 construction has now provided an excellent storm drainage outlet. However, local drainage facilities have not been constructed and/or modified to take advantage of this facility. Therefore persistent ponding in shallow depressions, road ditches and drainage ditches occurs even after light rainfalls. This standing water provides a breeding environment for mosquitos, kills lawns and other desirable vegetation, and degrades the visual quality of the area.

In addition to the surface effects of this poor storm drainage, excess standing water stresses subsurface drainage systems by extending the high water table duration in the spring and fall. Systems affected include foundation drains, sanitary sewers, and septic systems. Some impacts are increased roadway maintenance, increased quantities of groundwater leakage into sanitary sewers increasing the possibility of overload situations, and frequent septic system failures with their health and environmental hazard.

Inadequate Fish and Wildlife Habitat

Stream fish habitat is very poor due to water pollution and stream channel modifications. Pollution severely limits stream fishery species and populations. No species of endangered fish were identified.

Plant communities are being altered and destroyed by urban development. Habitat loss is reducing wildlife populations. Primary damage is caused by land use changes. Habitat is destroyed by clearing, filling, and blanketing land. Wetlands and other natural areas are rapidly being destroyed.

The barn owl and red-shouldered hawk are endangered species of wildlife in Illinois which exist in the watershed. The environment which supports them (open fields, meadows, pastures, thicket, hedgerows, edges of woods, brushy abandoned fields, woods, farms, and orchards) is being destroyed by urban development.

The existing small lakes and ponds provide very little good quality fish and wildlife habitat. Many are shallow and/or polluted and cannot be managed to produce sports fisheries. Adjacent land cover has limited value as wildlife habitat in most instances.

Economic and Social Problems

General economic conditions in the watershed area are considerably above state and national levels. However, pockets of high unemployment do exist in scattered localities such as East Chicago Heights and Robbins. Overall unemployment is estimated to be only slightly above the 2.1 percent rate for the metropolitan suburban area as of mid-1974.

Median family income is estimated to be about $14,000, or about 10 percent less than for the metropolitan suburban area. The median level of education is slightly less than for the total suburban area.

Housing varies greatly within the area but can be characterized in general as being older and having lower current market value than in other suburban areas. Substandard housing exists in some areas.

Flooding knows no boundaries and impacts heavily on low income communities. Such areas do not possess the economic means to alleviate the flooding problem and it therefore compounds their disadvantaged economic condition.

PROJECTS OF OTHER AGENCIES

The Illinois Department of Transportation, Division of Waterways, recently completed construction of a floodwater retarding structure on Midlothian Creek between 163rd and 167th Streets. This structure will store 920 acre feet of floodwater. The Division of Waterways has also undertaken some channel improvement and bridge modification work downstream of the floodwater retarding structure in Oak Forest. These structural improvements were considered in place and part of the integrated program for flood control on Midlothian Creek.

The Metropolitan Sanitary District of Greater Chicago (MSDGC) is presently constructing an excavated floodwater retarding structure on Calumet-Union Drainage Ditch between 175th Street and the Tri-State Tollway. This structure will provide 500 acre feet of floodwater storage on the East Branch. It was considered in place and part of the integrated program for flood control on Calumet-Union Drainage Ditch.

The Chicago District of the Corps of Engineers has been authorized to perform a clean-up project on the main stem of the Little Calumet River in Illinois. This will be a two-stage program consisting of a planning stage and then a contract for cleanup and debris removal. The MSDGC will be asked to be the local sponsor for this project action. Since this is an authorized project, it is being considered as a project of another agency which will be performed and be part of an integrated program for water resource development.

The MSDGC has recently completed and adopted a plan for collecting and treating water from combined sewer areas. The implementation of this Tunnel and Reservoir Plan will provide substantial water resource development benefits to the combined sewer area and adjacent separate sewered and unsewered areas. Primary benefits will be a reduction of combined sewer overflows, improved water quality, and floodwater damage reduction. Some alternatives in this plan make use of the Thornton Quarry for surface storage. This introduced the possibility of multiple use of the Thornton Quarry site for storage of combined sewer overflows as part of the Tunnel and Reservoir Plan and storage of excess floodwater from Thorn Creek as part (Structure 84) of this Floodwater Management Plan. The Tunnel and Reservoir Plan is being considered as in place and part of the total integrated program for water resource development.

The Chicago District of the Corps of Engineers has been authorized by the Congress of the United States to perform a study of the Little Calumet River and its tributaries. This authorization was provided by resolutions passed by the Committee on Public Works of the United States House of Representatives on July 29, 1955 and by the Committee on Public Works of the United States Senate on July 26, 1965. Under this authorization, the Corps of Engineers has prepared the Interim Review Report for the Little Calumet River in Indiana dated December 1973. The report recommends construction of a multiple purpose channel improvement plan for flood control, recreational navigation and recreation. The implementation of this plan is supported by the State of Indiana to satisfy its water resource development objectives. This plan is being considered as the recommended plan for the Indiana portion of the watershed and part of the total program for water resource development in the Little Calumet River Watershed.

PROJECT FORMULATION

The Little Calumet River is one of six watersheds encompassed by the Cooperative Studies for Preparation of the Chicago Metropolitan Area River Basin Plan. The Soil Conservation Service, USDA, entered into a cooperative agreement with the Metropolitan Sanitary District of Greater Chicago, in March of 1971, for this Type 4 River Basin Study.

Coordination with potential local project sponsors, interested agencies, and individuals was accomplished by establishing a steering committee in the watershed. This steering committee is composed of interested local citizens, municipal leaders, county government leaders, regional planning commission representatives, and known environmental group leaders. The committee holds regular monthly meetings at locations throughout the watershed area. Written notices of these meetings were sent to all members. Press coverage has been actively sought.

Coordination meetings were held at appropriate intervals with federal and state agencies with responsibility for water resource management. These included meetings with the State of Illinois, Department of Transportation, Division of Waterways; the Chicago District of the Corps of Engineers; and the U.S. Geological Survey. Throughout the planning process, individual local contacts were made with soil and water conservation districts, forest preserve districts, drainage districts, sanitary districts, park districts, municipal planning commissions, and interested citizens. In addition, coordination was accomplished by correspondence with such agencies as the Illinois Nature Preserves Commission and the Illinois Archaeological Survey.

Component Needs

Recognizing the primary goal as being floodwater management and the need for a coordinated plan for alleviating flood damage, the steering committee established the following component needs:

1. Implement a flood plain management program on 10,800 acres of flood plain lands.

2. Provide flood protection to 6,950 residences and 142 businesses.

3. Reduce erosion and sedimentation from 30,000 acres of crop and idle land and 2,000 acres under construction each year.

4. Provide 152,250,000 recreation user-day opportunities.

5. Enhance stream fishing in 60 miles of perennial stream.

6. Improve water quality in 109 miles of stream.

7. Provide 6,000 acres of public open space.

8. Protect 25,700 acres of existing wildlife habitat.

Considerations

Community health was recognized as an important consideration in the planning of a water resource development project for this watershed. Flooding produces a major community health problem. The inundation of inhabited areas by polluted floodwater contaminates public and private water supplies, homes, businesses, roadways, and recreational areas and facilities. Floodwater storage was strongly considered as the primary means to reduce flooding because of its ability to provide protection without inducing increased flooding problems downstream. Stream channel work and closed conduits were considered as alternatives when they could be planned in conjunction with floodwater storage. Channel work was restricted to segments which are already artificial drainage channels.

Recreational use of water inconventional floodwater storage structures is limited because of unacceptable surface water quality. Excavated storage structures bypass low flows and therefore provide an opportunity for better water quality recreational uses. Land based activities are a potential use except during flood periods. Where a permanent pool of water having adequate size and depth can be maintained from a groundwater source of sufficient quantity and acceptable quality, these pools will provide good opportunities for recreation. Although all structure sites will be open and therefore help fulfill the region's open space needs, no recreational use is intended without appropriate facilities.

Urban development continues to reduce the quantity and quality of resources such as wetlands, native prairies, woodland, and other fish and wildlife habitat. These resources were inventoried to facilitate the planning. Considerations were given to

preserving and enhancing them. Structures were located to avoid and/or minimize further adverse impacts. Excavated storage structures reduce impact by minimizing land requirements to meet objectives. Preservation of floodways minimizes the increase of flood levels by limiting encroachment and thereby removing the necessity to modify stream channels.

Much of the remaining fish and wildlife habitat is in and along the streams and flood plains. Extensive channel work would cause severe adverse environmental impacts. Full consideration was therefore given to solving the flood problems by constructing storage structures and thereby reducing the need for channel work. It is fully recognized that effective channel operation and maintenance is needed to maintain present carrying capacities of the channels and to preserve and enhance environmental values.

The Little Calumet River serves as the outlet for all tributary drainage. This channel cannot be enlarged without extensive relocations and bridge modifications. Therefore, measures which would increase flow rates and volumes of runoff from tributaries would either induce damages on the Little Calumet River or necessitate complex and expensive channel work. This is the major reason why emphasis was placed on preserving natural storage areas and providing man-made storage for excess runoff to solve flood problems.

Alternatives

The formulation of alternative plans to meet the specified components of the objectives included the development of alternatives for national economic development and environmental quality. Other alternatives were formulated to reflect various means and different levels of achievement. The beneficial and adverse effects of each alternative were evaluated and displayed in national economic development, environmental quality, regional development, and social well being accounts.

A preliminary screening was made to determine relevant alternatives. Some alternative means of meeting component needs were considered and rejected on the basis of obvious excessive costs and/or adverse social and/or environmental impacts. Purchase of existing improvements in the flood plain was an unacceptable alternative means because of the excessive adverse local economic and social impacts and the cost (108 million dollars) far exceeded other alternative means. Extensive channel work was unacceptable because (1) it would result in excessive costs, and (2) it would cause excessive adverse environmental impacts. Physical limitations (topography and developments) preclude consideration of conventional earth dam structures as an alternative means of meeting components

of the objectives. Flood insurance does not immediately reduce flood damages, but subsidized insurance greatly reduces the regional economic impact of flooding. Regulatory components of the flood insurance program discourage future damageable construction. Therefore, flood insurance is a desirable supplement to any alternative means selected.

A tunnel capable of diverting flood flows from the Little Calumet River near Thorn Creek into the Calumet-Sag Channel was considered in the preliminary screening process. Flood problems along the Little Calumet River would be alleviated, but flood damages would be increased along the Calumet-Sag Channel. Approximately 6,000 cfs would be diverted at maximum flood stage. The tunnel was estimated to cost about 29 million dollars.

The beneficial and adverse effects of three alternative plans are fully displayed in this report. Plan A was formulated to emphasize contributions to the environmental quality objective. Plan B was formulated to provide optimum contributions to the component needs of the national economic development objective. Plan C is the recommended plan selected from all of the alternative plans which were evaluated.

Alternative Plan A:

Preservation of such valuable resources as wetlands, native prairies, fossil sand dunes, and woodlands together with a channel maintenance program to preserve and enhance the aesthetic quality of the streams were the component needs of the objectives of the environmental quality plan. Elements of Plan A include:

1. Purchase 20 acres of the Homewood Sand Spit Dune and Prairie.

2. Purchase 978 acres of native hardwood forest.

3. Purchase 54 acres of identified types 2, 3, 4, and 5 wetlands and 54 acres to provide a protection border.

4. Accelerated land treatment program of erosion control for 8,400 acres of cropland and sediment reduction from 2,000 acres of construction area.

5. Channel maintenance program to preserve the aesthetic quality of 109 miles of streams.

6. Dry period low flow augmentation of 40 gallons per minute in Midlothian Creek. (Water well and pumping plant.)

The beneficial and adverse effects of Plan A are displayed in the following four accounts:

PLAN A - ENVIRONMENTAL QUALITY
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Components	Measures of Effects (Average Annual) 1/
Beneficial Effects:	
A. The value to users of increased outputs of goods and services.	
1. Recreation	$215,600
Total Beneficial Effects	$215,600
Adverse Effects:	
1. Purchase of Homewood Sand Spit	$ 5,600
2. Purchase of the Woodland Areas	276,200
3. Purchase of the Wetlands	30,500
4. Maintenance of Stream Channels	21,800
5. Low Flow Augmentation	
Project Installation	900
OM&R	1,000
Total Adverse Effects	$336,000
Net Beneficial Effects	- $120,400

1/ 100 years @ 5 7/8 percent interest.

Accelerated land treatment program not evaluated in monetary terms. Total installation cost estimated to be $1,911,900.

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PLAN A - ENVIRONMENTAL QUALITY
ENVIRONMENTAL QUALITY ACCOUNT

Components	Measures of Beneficial and Adverse Effects
Areas of Natural Beauty	1. Preserves 20 acres of fossil sand dune.
	2. Preserves 6 acres of original prairie.
	3. Provides 12 acres of open space in park forming a buffer between residential land and Washington Park Race Track.
	4. Enhances visual quality of new reservoir at 167th and Cicero and 10 miles of stream (Midlothian Creek).
	5. Disturbs vegetation on 2 acres during construction.
	6. Improves aesthetics of area by reducing erosion and sedimentation.
	7. Preserves and improves aesthetic qualities of 109 miles of stream.
	8. Provides 1,078 acres of open space.
Quality Considerations of Water, Land and Air Resources	1. Improves water quality of 167th and Cicero reservoir.
	2. Puts a new demand on groundwater (pumping).
	3. Augments stream flow by 40 gallons per minute during low flow periods.

PLAN A - ENVIRONMENTAL QUALITY
ENVIRONMENTAL QUALITY ACCOUNT (Continued)

	4. Prevents 52,700 tons of sediment from entering streams each year. 5. Reduces erosion rates on agricultural and idle land from an average of 8.4 T/AC/YR to 3.8 T/AC/YR. 6. Reduces sediment leaving construction sites from 11 T/AC/YR to 2 T/AC/YR. 7. Provides resource data for more compatible urban development. 8. Reduces turbidity of streams and reservoirs.
Biological Resources and Selected Ecosystems	1. Preserves 978 acres of prime woodland, wildlife habitat and relatively undisturbed needed timber. 2. Preserves 54 acres of prime wildlife habitat utilized by squirrel, rabbit, raccoon, water fowl and songbirds. 3. Improves sport fishery in 167th and Cicero reservoir. 4. Enhances existing channel ecosystem.
Irreversible or Irretrievable Commitments of Resources	Monetary and other resources needed to implement the plan.

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PLAN A - ENVIRONMENTAL QUALITY
REGIONAL DEVELOPMENT ACCOUNT

Components	Beneficial Effects: Chicago Metropolitan Area (Average Annual)	Beneficial Effects: Rest of Nation (Average Annual)1/	Adverse Effects: Total (Average Annual)1/
Income:			
A. Value of Increased Output to Region			
1. Recreation	$215,600	-	-
2. Construction Wages	8,000	$- 8,000	-
3. OM&R Wages	11,500	-11,500	-
B. External Economies			
1. Induced Activities	21,600	-21,600	-
C. Resources Contributed from within Region			
1. Installation	-	-	$313,200
2. OM&R	-	-	22,800
3. Land Treatment Program			
Installation	-	-	86,900
Technical Assistance	-	-	25,800
Total Effects	$256,700	$-41,100	$448,700
Employment:			
A. Jobs			
1. Recreation	0.5 Perm.	-0.5 Perm.	-
2. OM&R	1.5 Perm.	-1.5 Perm.	-
Total Effects	2 Perm.	-2 Perm.	-
Net Beneficial Effects	2 Perm.	-2 Perm.	-

1/ 100 years @ 5 7/8 percent interest.

May 1975

PLAN A - ENVIRONMENTAL QUALITY

SOCIAL WELL-BEING ACCOUNT

Components	Measures of Beneficial and Adverse Effects
Real Income Distribution	1. Creates 2 permanent jobs for area residents.
	2. Creates regional income benefit distribution of $256,700. Approximately 80 percent of all benefits are to an income class of more than $10,000.
Life, Health and Safety	1. Preserves opportunities for observing wildlife in its natural habitat.
Recreational Opportunities	1. Creates 287,500 recreational visitor-day activities.

May 1975

Alternative Plan B:

Plan B provides for the management of the 100-year flood at minimum costs. Because of threat to human life, some elements have been included in this plan which do not contribute to economic efficiency. Many residences protected by the additional measures are occupied by low-income minority people. Total benefits of Plan B exceed total costs. Installation cost of these structural measures is estimated to be $28,712,800. Elements of Plan B include:

1. Excavated floodwater retarding structures 53, 84, and 143.

2. Excavated multiple purpose structure 32 (floodwater retarding, recreation, and recreation facilities).

3. Re-establishment of a flood flow outlet for Natalie Creek from Crawford Avenue to Midlothian Creek at the point where it crosses under the Tri-State Tollway. This connection would include both closed conduit and open channel.

4. Channel work on Midlothian Creek between 137th Street and the Chicago-Rock Island and Pacific Railroad.

5. Flood plain regulations.

6. Flood proofing.

Beneficial and adverse effects of Plan B are displayed in the following four accounts:

PLAN B - MODIFIED NATIONAL ECONOMIC DEVELOPMENT

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Components	Measures of Effects (Average Annual 1/)
Beneficial Effects:	
A. The value to users of increased outputs of goods and services.	
1. Flood Control	$3,036,900
2. Recreation	87,800
Total Beneficial Effects	$3,124,700
Adverse Effects:	
1. Excavated Floodwater Retarding Structures and Channel Work	
Project Installation	$1,601,800
Project Administration	84,800
OM&R	98,300
2. Recreation Development	
Installation	6,000
OM&R	4,400
3. Flood Proofing	7,500
4. Flood Plain Regulations	62,500
Total Adverse Effects	$1,865,300
Net Beneficial Effects	$1,259,400

1/ 100 years @ 5 7/8 percent interest.

May 1975

PLAN B - MODIFIED NATIONAL ECONOMIC DEVELOPMENT
ENVIRONMENTAL QUALITY ACCOUNT

Components	Measures of Beneficial and Adverse Effects
Areas of Natural Beauty	1. Disturbs vegetation on 190 acres.
	2. Provides 302 acres of public open space.
	3. Preserves 3900 acres of corridor along 109 miles of stream.
	4. Preserves and improves aesthetic qualities of 109 miles of stream.
Quality Considerations of Water, Land and Air Resources	1. Increases erosion and sediment during construction from disturbing 200 acres.
	2. Increases traffic noise and dust during construction.
	3. Provides approximately 4,000 GPM additional stream flow.
	4. Lowers groundwater table near structures.
	5. Reduces surcharge of Calumet River into Lake Michigan and assists in minimizing the flow of wastes to the lake.
Biological Resources and Selected Ecosystems	1. Provides 71 acres of water capable of supporting fish life.
	2. Changes 0.38 miles of earth channel to concrete lined.
	3. Temporarily disturbs stability of 3.8 miles of channel.
Irreversible or Irretrievable Committments of Resources	1. Commits 41 acres of land to sediment pools.
	2. Commits 15.0 acres of land to recreation pool.

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PLAN B - MODIFIED NATIONAL ECONOMIC DEVELOPMENT
REGIONAL DEVELOPMENT ACCOUNT

Components	Beneficial Effects		Adverse Effects
	Chicago Metro-politan Area	Rest of Nation	Total
	(Average Annual)1/		(Average Annual)1/
Income:			
A. Value of Increased Output to Region			
1. Flood Control	$3,036,900	-	-
2. Recreation	87,800	-	-
3. Construction Wages	210,800	$-210,800	-
4. OM&R Wages	39,300	- 39,300	-
B. External Economies			
1. Induced Activities	8,800	- 8,800	-
C. Resources Contributed from Within Region			
1. Installation	-	-	$1,601,800
2. Project Administration	-	-	84,800
3. OM&R	-	-	98,300
4. Recreation Development			
Installation	-	-	6,000
OM&R	-	-	4,400
5. Flood Proofing	-	-	7,500
6. Flood Plain Regulation	-	-	62,500
Total Effects	$3,383,600	$-258,900	$1,865,300
Employment:			
A. Jobs			
1. Recreation	.5 Perm.	-.5 Perm.	-
2. Construction	24 10-yr.	-24 10-yr.	-
3. OM&R	3 Perm.	- 3 Perm.	-
Total Effects	3.5 Perm.	-3.5 Perm.	-
	24 10-yr.	-24 10-yr.	-
Net Beneficial Effects	3.5 Perm.	-	-
	24 10-yr.	-	-

1/ 100 years @ 5 7/8 percent interest.

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PLAN B - MODIFIED NATIONAL ECONOMIC DEVELOPMENT

SOCIAL WELL-BEING ACCOUNT

Components	Measures of Beneficial and Adverse Effects
Real Income Distribution	1. Creates 3.5 permanent jobs for area residents.
	2. Creates regional income benefit distribution of $3,383,600. Approximately 80 percent of all benefits are to an income class of more than $10,000.
Life, Health and Safety	1. Provides a reduction of 6,140 traffic disruptions annually.
	2. Reduces health hazard caused by inundation of residences by polluted floodwater.
	3. Protects 6,695 residences and 142 businesses from 100-year flood.
	4. Removes floodwater from land and streets where an additional 1,100 homes and 25 businesses are located.
	5. Increases hazard to human life from drowning and traffic accidents.
	6. Provides technical assistance to 254 homeowners to assist with flood proofing.
	7. Protected tree cover removes air impurities, reduces noise, moderates climatic conditions of wind and temperature, and provides aesthetic screening and a sanctuary for wildlife.
Recreational Opportunities	1. Creates 43,700 recreational visitor-day activities.

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Effects of Plans A and B were discussed with the steering committee and local task force groups. Other alternative plans were then generated. These alternatives were based on the following considerations:

1. Structure sites should be located to avoid major conflicts with environmental resources.

2. Use of excavated storage should be maximized to meet objectives, minimize land requirements, and prevent induced damages downstream.

3. Undeveloped flood plains should be preserved.

Two combinations of three excavated floodwater retarding structures and excavated multiple purpose structure 32 were evaluated to determine their effectiveness as a primary means to achieve an acceptable reduction in present and future flooding of existing improvements. In addition, two alternatives were generated which incorporated two combinations of channel work. These alternatives are shown as follows:

Alternative	Structures	Channel Work
1	32, 53, 84, 143	None
2	32, 55, 84, 143	None
3	32, 53, 84, 143	Natalie Creek Midlothian Creek 137th - 139th St. Midlothian Creek 137th St. to Rock Island Railroad
4	32, 53, 84, 143	Natalie Creek Midlothian Creek 137th - 139th St. Midlothian Creek 137th St. to Calumet-Sag Channel Calumet-Union Drainage Ditch Western Ave. to Halsted

Alternative Plan 1 was not adequate in meeting the floodwater management objectives. Significant pockets of remaining damage existed in Midlothian, Robbins, and Markham. The cost of the structures in this alternative plan are estimated to be $27,254,000.

Alternative Plan 2 also was not able to meet the floodwater management objectives. Like Alternative 1, significant damages remained in Midlothian, Robbins, and Markham. In addition to these adverse effects, relocation of 80 homes would be necessary for the installation of Structure 55. The cost of the structures in this alternative plan is estimated to be $30,644,000.

Alternative Plan 3 included some channel enlargement in the areas of remaining damages in Alternatives 1 and 2. These channel enlargements increased the level of protection in the problem areas to be consistent with those reached in other areas with the structures alone. However, an adverse impact of extending the channel from 139th Street to the Rock Island Railroad would be the relocation of two homes along the existing channel banks. Ending the new channel at the Rock Island Railroad would also aggravate an existing trash accumulation problem at the jurisdictional boundary at the Village of Robbins and the Rock Island Railroad. The cost of this combination of structures plus the channel work would be $29,221,000.

Alternative Plan 4 provides the same level of floodwater damage reduction as Alternative 3. However, a diversion conduit is substituted for channel improvement from 137th Street to the Rock Island Railroad. This diversion conduit eliminates the need for relocation of the two homes and it also provides a means for discharging debris directly into the Calumet-Sag Channel. The cost of this alternative is estimated to be $30,546,000.

Two alternative measures were considered to prevent flood damage to future developments. One measure consisted of purchase of the undeveloped flood plain. The other measure consisted of regulating future development of the flood plain. With regulations, the floodway would be maintained to store floodwater and convey flood flows by restricting new construction to that portion of the flood plain outside of the floodway. Elevation of new construction would be controlled to prevent future flooding of buildings on the flood plain fringe.

The above two measures were considered separately in combination with the various combinations of structural measures to provide a complete program for present and future floodwater management. Preservation of the floodway by purchase or regulation is considered an absolute requirement prior to investment of funds for the installation of other measures for flood control. Flood plain regulation was chosen as the measure to be included in the selected plan.

Alternative Plan C:

The selected plan (Alternative Plan 4) was developed as a result of presenting the effects of alternatives to the steering committee. Consideration was given to local constraints and abilities in making the final selections.

Installation cost of these structural measures is estimated to be $30,546,000. Elements of Plan C include:

1. Excavated floodwater retarding structures 53, 84, and 143.

2. Excavated multiple purpose structure 32 (floodwater retarding, recreation, and recreation facilities).

3. Re-establishment of a flood flow outlet for Natalie Creek from Crawford Avenue to Midlothian Creek at the point where it crosses under the Tri-State Tollway. This connection would include both closed conduit and open channel.

4. Channel work on Midlothian Creek between 137th Street and 139th Street.

5. Construction of a diversion conduit from Midlothian Creek at 137th Street north along Sawyer Avenue to outlet into the Calumet-Sag Channel.

6. Channel work on the Calumet-Union Drainage Ditch from Western Avenue to Halsted Street.

7. Flood plain regulations.

8. Channel maintenance.

9. Flood proofing.

10. Land treatment measures.

The effects of the selected plan and trade-offs between Plans A and B compared with the selected plan are presented as follows:

PLAN C - SELECTED PLAN
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Components	Measures of Effects (Average Annual) 1/
Beneficial Effects:	
A. The value to users of increased outputs of goods and services.	
1. Flood Control	$3,064,500
2. Recreation	87,800
Total Beneficial Effects	$3,152,300
Adverse Effects:	
1. Excavated Floodwater Retarding Structures, Multiple Purpose Structure and Channel Modification	
Project Installation	$1,708,900
Project Administration	91,800
OM&R	103,000
2. Maintenance of Stream Channels	38,000
3. Recreation Development	
Installation	6,000
OM&R	4,400
4. Land Treatment Program	
Project Installation	86,100
Technical Assistance	25,800
5. Flood Proofing	7,000
6. Flood Plain Regulations	62,500
Total Adverse Effects	$2,133,500
Net Beneficial Effects	$1,018,800

1/ 100 years @ 5 7/8 percent interest.

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PLAN C - SELECTED PLAN
ENVIRONMENTAL QUALITY ACCOUNT

Components	Measures of Beneficial and Adverse Effects
Areas of Natural Beauty	1. Disturbs vegetation on 200 acres. 2. Provides 302 acres of public open space. 3. Preserves 3900 acres of corridor along 109 miles of stream. 4. Preserves and improves aesthetic qualities of 109 miles of stream. 5. Improves aesthetic qualities of area by reducing erosion and sedimentation.
Quality Considerations of Water, Land and Air Resources	1. Increases erosion and sediment during construction from disturbing 200 acres. 2. Increases traffic noise and dust during construction. 3. Provides approximately 4,000 GPM additional stream flow. (Groundwater seepage into structures which is pumped out into streams.) 4. Lowers groundwater table near structures. 5. Prevents 52,700 cu.yds. of sediment from entering streams each year. 6. Reduces erosion rates on agricultural and idle land from an average of 8.4 T/AC/YR to 3.8 T/AC/YR.

PLAN C - SELECTED PLAN
ENVIRONMENTAL QUALITY ACCOUNT
(Continued)

Components	Measures of Beneficial and Adverse Effects
	7. Reduces sediment leaving construction sites from 11 T/AC/YR to 2 T/AC/YR.
	8. Provides resource data for more compatible urban development.
	9. Reduces turbidity of streams and reservoirs.
	10. Maintains visual quality of land in urban and urbanizing areas by protecting and improving tree cover.
	11. Reduces surcharge of Calumet River into Lake Michigan and assists in minimizing the flow of wastes to the lake.
Biological Resources and Selected Ecosystems	1. Provides 71 acres of water capable of supporting fish life.
	2. Changes 0.38 miles of earth channel to concrete lined.
	3. Temporarily disturbs stability of 3.8 miles of channel.
Irreversible or Irretrievable Commitments of Resources	1. Commits 41 acres of land to sediment pools.
	2. Commits 15.0 acres of land to recreational pool.

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PLAN C - SELECTED PLAN
REGIONAL DEVELOPMENT ACCOUNT

Components	Beneficial Effects: Chicago Metropolitan Area (Average Annual)	Beneficial Effects: Rest of Nation (Average Annual)1/	Adverse Effects: Total (Average Annual)1/
Income:			
A. Value of Increased Output to Region			
1. Flood Control	$3,064,500	-	-
2. Recreation	87,800	-	-
3. Construction Wages	228,400	$-228,400	-
4. OM&R Wages	41,200	- 41,200	-
B. External Economies			
1. Induced Activities	8,800	- 8,800	-
C. Resources Contributed From Within Region			
1. Installation	-	-	$1,708,900
2. Project Administration	-	-	91,800
3. OM&R	-	-	141,000
4. Land Treatment Program			
Installation	-	-	86,100
Technical Assistance	-	-	25,800
5. Recreation			
Installation	-	-	6,000
OM&R	-	-	4,400
6. Flood Proofing	-	-	7,000
7. Flood Plain Regulations	-	-	62,500
Total Effects	$3,430,700	$-278,400	$2,133,500
Employment:			
A. Jobs			
1. Recreation	.5 Perm.	-.5 Perm.	-
2. Construction	26 10-yr.	-26 10-yr.	-
3. OM&R	3 Perm.	- 3 Perm.	-
Total Effects	3.5 Perm. 26 10-yr.	-3.5 Perm. -26 10-yr.	-
Net Beneficial Effects	3.5 Perm. 26 10-yr.	- -	- -

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PLAN C - SELECTED PLAN
SOCIAL WELL BEING ACCOUNT

Components	Measures of Beneficial and Adverse Effects
Real Income Distribution	1. Creates 3.5 permanent jobs for area residents.
	2. Creates regional income benefit distribution of $3,430,700. Approximately 80 percent of all benefits are to an income class of more than $10,000.
Life, Health and Safety	1. Provides a reduction of 7,300 travel disruptions annually.
	2. Reduces health hazard caused by inundation of residences by polluted floodwater.
	3. Protects residents of 6,710 homes and 142 businesses from 100-year flood.
	4. Removes floodwater from land and streets where an additional 1,400 residences and 30 businesses are located.
	5. Increases hazard to human life from drowning and traffic accidents.
	6. Provides technical assistance to 239 homeowners to assist with flood proofing.
	7. Protected tree cover removes air impurities, reduces noise, moderates climatic conditions of wind and temperature, and provides aesthetic screening and a sanctuary for wildlife.
Recreational Opportunities	1. Creates 43,700 recreational user-day activities.

COMPARISON OF DIFFERENCES OF SELECTED PLAN WITH PLAN A

Account	Plan A	Selected Plan	Differences (Selected Plan Minus Plan A)
National Economic Development			
Beneficial Effects	$215,600	$3,152,300	+$2,936,700
Adverse Effects	448,700	2,133,500	+ 1,684,800
Net Beneficial Effects	- 233,100	1,018,800	+ 1,251,900
Environmental Quality			
Beneficial and Adverse Effects			
A. Areas of Natural Beauty	Preserves 20 acres of fossil sand dunes.	----	- Preserves 20 acres of fossil sand dunes.
	Preserves 6 acres of native prairie.	----	- Preserves 6 acres of native prairie.
	Provides 1,078 acres of open space.	Provides 302 acres of open space.	- 776 acres of open space
	Enhances visual quality of reservoir and 10 miles of stream.	----	- Enhances visual quality of reservoir and 10 miles of stream.
	Disturbs vegetation on 2 acres.	Disturbs vegetation on 200 acres.	+ 198 acres of vegetation disturbed.
	----	Preserves 3900 acres of corridor along 109 miles of streams	+ Preserves 3900 acres of corridor along 109 miles of streams.

COMPARISON OF DIFFERENCES OF SELECTED PLAN WITH PLAN A

(Continued)

Account	Plan A	Selected Plan	Differences (Selected Plan Minus Plan A)
B. Quality Considerations of water, land and air resources.	Improves water quality of new reservoir.	----	- Improves water quality of new reservoir.
	Puts a new demand on ground water.	----	- Puts a new demand on ground water.
	Augments stream flow in Midlothian Creek by 40 GPM.	----	- 40 GPM of stream augmentation in Midlothian Creek.
	----	Augments stream flow in North Creek by 4,000 GPM.	+ 4,000 GPM of stream augmentation in North Creek.
	----	Increases erosion and sediment during construction.	+ Increases erosion and sediment during construction.
	----	Increases traffic noise and dust during construction.	+ Increases traffic noise and dust during construction.
	----	Reduces discharge of Little Calumet River into Lake Michigan through Lake Calumet.	+ Reduces discharge of Little Calumet River into Lake Michigan through Lake Calumet.

COMPARISON OF DIFFERENCES OF SELECTED PLAN WITH PLAN A
(Continued)

Account	Plan A	Selected Plan	Differences (Selected Plan Minus Plan A)
C. Biological Resources and Selected Ecosystems	Preserves ecosystem on 978 acres of natural woodland.	----	- Preserves ecosystem on 978 acres of natural woodland.
	----	Provides 71 acres of water capable of supporting fish life.	+ Provides 71 acres of water capable of supporting fish life.
	Preserves ecosystem on 54 acres of wetlands.	----	- Preserves ecosystem on 54 acres of wetlands.
	----	Changes 0.38 miles of earth channel to concrete lined.	+ Changes 0.38 miles of earth channel to concrete lined.
D. Irreversible or Irretrievable Commitments	----	Commits 41 acres to sediment pools.	+ Commits 41 acres to sediment pools.
	----	Commits 15 acres to recreation pool.	+ Commits 15 acres to recreation pool.
Regional Development			
Chicago Metropolitan Area			
A. Income: Beneficial Effects	$256,700	$3,430,700	+$3,174,000
B. Employment: Project Installation	----	26 10-year. 3.5 Perm.	+ 26 10-year. + 3.5 Perm.

COMPARISON OF DIFFERENCES OF SELECTED PLAN WITH PLAN A
(Continued)

Account	Plan A	Selected Plan	Differences (Selected Plan Minus Plan A)
Social Well Being			
A. Life, Health and Safety	Preserves opportunities for observing wildlife in its natural habitat.	----	- Preserves opportunities for observing wildlife in its natural habitat.
	----	Provides a reduction of 7,300 travel disruptions annually.	+ Provides a reduction of 7,300 travel disruptions annually.
	----	Reduces health hazard caused by inundation of residences by polluted floodwater.	+ Reduces health hazard caused by inundation of residences by polluted floodwater.
	----	Protects 6,710 residences and 142 businesses from 100-year flood.	+ Protects 6,710 residences 142 businesses from 100-year flood.
	----	Removes floodwater from land and streets where an additional 1,400 residences and 30 businesses are located.	+ Removes floodwater from land and streets where an additional 1,400 residences and 30 businesses are located.
	----	Increases hazard to human life from drowning and traffic accidents.	+ Increases hazard to human life from drowning and traffic accidents.

COMPARISON OF DIFFERENCES OF SELECTED PLAN WITH PLAN A
(Continued)

Account	Plan A	Selected Plan	Differences (Selected Plan Minus Plan A)
	----	Provides technical assistance to 239 homeowners to assist with flood proofing.	+ Provides technical assistance to 239 homeowners to assist with flood proofing.
B. Recreational Opportunities	Creates 287,500 user-days of recreation activities.	Creates 43,700 user-days of recreation activities.	- 243,800 user-days of recreation activities.

COMPARISON OF DIFFERENCES OF SELECTED PLAN WITH PLAN B

Account	Plan B	Selected Plan	Differences (Selected Plan Minus Plan B)
National Economic Development			
Beneficial Effects	$3,124,700	$3,152,300	+ 27,600
Adverse Effects	1,865,300	2,133,500	+ 268,200
Net Beneficial Effects	1,259,400	1,018,800	- 240,600
Environmental Quality			
Beneficial and Adverse Effects			
A. Areas of Natural Beauty	Disturbs vegetation on 190 acres.	Disturbs vegetation on 200 acres.	+ 10 acres of disturbed vegetation.
	Preserves 3900 acres of corridor along 109 miles of stream.	Preserves 3900 acres of corridor along 109 miles of stream.	----
	Preserves and improves aesthetic qualities of 109 miles of streams.	Preserves and improves aesthetic qualities of 109 miles of streams.	----
	----	Improves aesthetics of area by reducing erosion and sedimentation.	+ Improves aesthetics of area by reducing erosion and sedimentation.

COMPARISON OF DIFFERENCES OF SELECTED PLAN WITH PLAN B
(Continued)

Account	Plan B	Selected Plan	Differences (Selected Plan Minus Plan B)
B. Quality Considerations of Water, Land and Air Resources	----	Prevents 52,700 tons of sediment from entering streams each year.	+ Prevents 52,700 tons of sediment from entering streams each year.
	----	Reduces erosion rates on agricultural and idle land from an average of 8.4 T/AC/YR to 3.8 T/AC/YR.	+ Reduces erosion rates on agricultural and idle land from an average of 8.4 T/AC/YR to 3.8 T/AC/YR.
	----	Reduces sediment leaving construction sites from 11 T/AC/YR to 2 T/AC/YR.	+ Reduces sediment leaving construction sites from 11 T/AC/YR to 2/AC/YR.
	----	Provides resource data for more compatible urban development.	+ Provides resource data for more compatible urban development.
	----	Reduces turbidity of streams and reservoirs.	+ Reduces turbidity of streams and reservoirs.
C. Biological Resources and Selected Ecosystems	----	----	----

COMPARISON OF DIFFERENCES OF SELECTED PLAN WITH PLAN B
(Continued)

Account	Plan B	Selected Plan	Differences (Selected Plan Minus Plan B)
Regional Development			
Chicago Metropolitan Area			
A. Income			
Beneficial Effects	$3,383,600	$3,430,700	+ $47,100
B. Employment Project Installation	24 10-year.	26 10-year.	+ 2 10-year.
Social Well Being			
A. Life, Health and Safety	Provides a reduction of 6,140 traffic disruptions annually.	Provides a reduction of 7,300 traffic disruptions annually.	+ Reduces 1,160 traffic disruptions
	Protects 6,695 residences and 142 businesses from a 100-year flood.	Protects 6,710 residences and 142 businesses from a 100-year flood.	+ 15 residences protected from 100-yr. flood.
	Provides technical assistance to 254 homeowners to assist with flood proofing.	Provides technical assistance to 239 homeowners to assist with flood proofing.	- 15 residences requiring flood proofing assistance.

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SELECTED PLAN MEASURES TO BE INSTALLED

Selected non-structural measures consist of a land treatment program, a flood plain management program, a channel operation and maintenance program and a flood proofing program. The annual cost of the non-structural program is $219,400.

Selected structural measures consist of three single purpose excavated floodwater retarding structures, one multiple purpose structure (floodwater storage plus recreational storage and associated facilities), and three sections of previously modified stream channel work totaling 3.8 miles. Total cost of the structural measures is estimated to be $30,647,800. Annual operation and maintenance costs are $107,400.

Land Treatment Program

The land treatment program for the Little Calumet River Watershed is divided into four general categories: (1) reduction of runoff, erosion, and sediment from construction areas, (2) erosion control systems on agricultural, idle, and forest land, (3) natural resource information and resource conservation planning assistance to land users and units of government, and (4) protection and aesthetic improvement of vegetative cover.

Accelerated technical assistance will be provided to local units of government and land users. It will include assistance to units of government in preparation of resource plans and their implementation through sediment and erosion control ordinances. Land users will receive assistance in conservation planning.

Approximately 1,000 acres of land under construction will need temporary treatment each year as development continues. Measures such as debris basins, diversions, and vegetative cover will be required to prevent excessive runoff, erosion, sedimentation and impaired visual quality. A comprehensive sediment and erosion control ordinance will be adopted by local units of government to achieve proper treatment of land being converted from agricultural, forest, and idle to urban uses.

Technical assistance will be provided to land users for application of land treatment measures. Conservation tillage and conservation cropping systems will be applied to cropland. Mechanical measures such as terraces, diversions and waterways will be utilized to accomplish erosion control on limited agricultural land. Permanent vegetation will be established on idle land.

Natural resource information and soil interpretations will be provided to decision makers for land use planning and installation of resource management systems. Technical data available will include inventories of wetlands, natural areas, critical erosion areas, and unique scenic areas. Soil limitation information for specific uses such as septic fields, urban development, intensive play areas, and agriculture are available.

The forestry program will require considerable acceleration of the federal-state cooperative forestry programs and/or employment of forestry consultants.The following annual forestry program is planned:

1. Urban forestry - Assist and cooperate with regional planning commissions, city foresters, community leaders, park districts, forest preserve districts,municipalities and individual homeowners requests for technical forestry assistance ... 400 manhours.

2. Forest pest control - Assists forest preserve districts, park districts, municipalities and individuals...300 manhours.

3. Fire control - Assists municipal fire departments in forest fire fighting techniques, prevention measures and control of woodland fires ... 50 manhours.

4. Tree planting (open land) - Assists all ownerships around structure sites and recreation areas for screening purposes, noise abatement, wildlife habitat, aesthetics, landscaping and regular rural and urban tree planting requests for public land (40 acres) and private land (10 acres).

5. Management plans and information and education - Conducts an effective program to get forest land under management and strive to increase public and private awareness of forest land values as a part of land use planning and zoning; especially the non-industrial values such as watershed protection, air and noise pollution abatement, screening, erosion control, recreation, temperature and wind velocity reduction, wildlife, etc.

The installation cost of the needed land treatment measures is estimated to average $86,100 annually. This includes the cost of measures such as debris basins, diversions, and vegetative cover which will be installed each year on land being developed as required by ordinances to prevent excessive runoff, erosion, and sedimentation from construction areas. Also included are the costs of installing forestry measures (tree planting and timber stand improvement).

The accelerated technical assistance for the land treatment program is estimated to cost $25,800 annually. These funds will be used to provide technical assistance to accelerate the current programs. Estimated costs for technical assistance are based on current expenditures for comparable work.

Flood Proofing Program

After installation of the structural measures, some 239 existing residences would still be subject to flooding by a with project condition 100-year frequency flood. A list (by tributary) of the number of residences to be flood proofed follows:

Midlothian Creek	11
Butterfield Creek	1
Thorn Creek	8
Deer Creek	198
North Creek	8
Little Calumet River (Main Stem)	13

This list does not include homes subject to flooding caused by sanitary sewer backup. The above homes have been identified and this information provided to each local governmental unit.

The local governmental units will provide technical assistance to individual property owners to assist them with the flood proofing of improvements. Each homeowner with remaining flood damages will be contacted. The remaining flood hazards will be explained and methods of flood proofing will be provided. Typical flood proofing measures which should be installed are flap gates, sump pumps, barricades to seal openings, and small levees.

The estimated average annual cost of providing flood proofing assistance is $7,000.

Stream Channel Operation and Maintenance Program

Existing stream channels in the evaluated areas will be maintained to perform at their present capacity. Agreements will be made with the appropriate entities of government, including drainage districts, to carry out this program for the life of the project (100 years). Evaluations in this plan are based on adequately maintained channels of at least present flow capacities.

Agreements for operating and maintaining the existing channels to perform equal to their capacities will also be executed prior to installation of the proposed structural measures.

The cost of maintaining the stream channels in their present state is estimated to average $38,000 annually.

Flood Plain Management Program

Control of future development in the flood plain and preservation of the floodway will be accomplished with flood plain regulations. Development within the 100-year flood plain, as identified on the flood plain topographic maps which accompany this report, will be regulated by local zoning, subdivision and building code ordinances.

The floodway, as delineated on the flood plain topographic maps, will be preserved for floodwater storage and conveyance. Developments within the floodways will be restricted to types of development which will not adversely affect their ability to convey floodwaters. Examples of the type of development that would be permitted include parking lots, parks, recreation areas, and forest preserves. The construction of any buildings or the placing of any landfill will not be permitted within the delineated floodway.

Flood proofed development will be permitted on the outer flood plain area known as the floodway fringe. On the floodway fringe, land filling (with compensatory storage) and construction may take place. However, all new improvements on this portion of the flood plain must be constructed at an elevation so as to not be damaged by the projected condition 100-year frequency flood, as defined by the flood profiles which accompany this report. To avoid damages from a 100-year flood, it is recommended that all new construction be at least two feet above this flood profile. (See sample flood plain topographic map LC-5 and flood profile inside the back cover of this report.)

This approach permits flood proofed development in the floodway fringe but tightly restricts development in the floodway. These regulations can be accomplished by revising existing flood plain compensatory storage ordinances, zoning ordinances, subdivision ordinances, and building codes. Hearings will be held and ordinances and building codes will be revised by the appropriate entities of local government to accomplish the above before the selected plan will be installed.

By implementing these regulations and additional land use control measures, each unit of local government will satisfy the minimum requirements of the Federal Insurance Administration, Department of Housing and Urban Development for participation in the regular phase of the National Flood Insurance Program. Federally subsidized flood insurance, not previously available from the private insurance industry, can then be made available for all existing buildings and contents. All buildings within the area subject to inundation by the projected condition 100-year flood should be insured.

An acceptable flood plain regulation program as outlined in this report, shall be enforced in the study area prior to the installation of the planned structural measures. This requires that local governmental organizations revise zoning ordinances, subdivision ordinances, and building codes to preserve a floodway. They must also regulate new construction in the remainder of the flood plain in such a way that it will not be subject to overbank flooding from the projected 100-year flood with the project measures installed.

The cost of implementing an acceptable flood plain management program is estimated to total $62,500 annually.

Locations of structural measures are shown on the project map inside the back cover of this report. Proposed layouts of each structure are shown on Exhibits 1 through 7. Structure data for each individual structure is listed in Table 2 (page 105). Design data for the channel work is shown in Table 2a (page 107).

Excavated Floodwater Retarding Structures

An excavated floodwater retarding structure is a reservoir excavated below flood plain elevation with diversion facilities to direct floodwater into the reservoir and pumping facilities to empty the reservoir after a flood. The main components consist of the diversion structure, an inlet structure, an excavated storage reservoir, and a pumping plant.

The diversion structure is usually an earth fill built across the floodway with reinforced concrete conduits through the fill at channel level. It limits the amount of water which can be conveyed in the floodway beyond the diversion structure and diverts any excess flows through the inlet structure into the excavated storage reservoir. Structures 53 and 143 will have this type of inlet structure. Structures 32 and 84 will not have a diversion structure. The excess flows to the inlet structure of these two structures will be regulated by a channel stage gage. The inlet structure for Structure 53 will consist of an entrance area and a straight drop spillway. The inlet structure for Structure 143 will be a structural system consisting of a straight drop spillway, a transition section, and a straight inlet chute. The inlet structure of Structure 84 will consist of three automatic gates that will raise to allow water to pass over a straight drop spillway. The flows from the straight drop spillway will be conveyed to a vertical drop shaft approximately 150 feet deep into an air separation chamber. From there the flow will travel horizontally 2,600 feet in a mined rock tunnel to the Thornton Quarry.

The excavated storage reservoir is a single reservoir (Structures 53, 84, and 143) excavated below the elevation of the flood plain and is used to store floodwater in excess of that conveyed through the diversion structure. The reservoirs will range from approximately 24 feet deep (Structure 53) to over 200 feet deep (Structure 84) with the reservoir of Structure 143 approximately 40 feet deep. The four reservoirs will have total storage capacities ranging from 567 to 9,595 acre feet.

The reservoir side slopes will range from vertical (Structure 84) to 4:1 (Structures 53 and 143). A portion of the reservoir bottom will consist of a permanent pool for the accumulation of sediment over the 100-year design life of the reservoir. These pools will be at least 5 feet deep. The material to be excavated in these structures varies considerably. Structure 53 excavation will consist of clays underlain by fine sands. Structure 84 is located in an active limestone quarry and will be entirely in rock.

Structure 143 is located in an existing sand pit. Soil material will be hauled into the pit to stabilize the side slopes and blanket the bottom. This material will come from an excavation south of the existing pit. The foundations of Structures 53 and 143 are yielding and most measures constructed for Structure 84 will be on or in solid rock.

Structure 143 will have Burnham Avenue constructed on the east side of the reservoir. This road will be constructed by the Cook County Highway Department. The road shall have a 100-foot top width and 3:1 side slopes.

The reservoir of Structure 84 will be constructed at the same time as the adjacent reservoir proposed for the storage of combined sewage and floodwater by the City of Chicago and the Metropolitan Sanitary District of Greater Chicago. The rock excavated from this reservoir will be stockpiled or sold during construction with the stockpiled material being eventually sold.

Multiple Purpose Structure 32

Structure 32 will consist of an excavated floodwater storage structure with additional excavation being done to add recreation storage. The entire reservoir bottom will contain permanent water.

The inlet structure will be a straight inlet chute with an automatic gate that will rise to allow the excess flows to enter the reservoir. The automatic gate will be controlled by a stream stage gage that will raise or lower the gate to allow the desired diversion flow.

The material to be excavated in the reservoir will be peat to a maximum depth of 20 feet underlain by very soft clays. The side slope of the reservoir will vary from 3:1 to 10:1. The side slopes of the reservoir in peat will be blanketed with a more stable soil material. The structures will be installed on a yielding foundation.

Structure 32 will require 118 acres of land of which 12.7 acres will be permanent water and 40 acres will be suitable for associated recreation use. Recreation use will include boating, canoeing, and fishing. Land areas will be developed for both summer and winter playground activities.

The one multiple purpose structure and the three excavated floodwater retarding structures will have a total combined storage capacity of 12,229 acre feet. (See Table 2, page 105, for structure data.) Total floodwater storage will be 11,848 acre feet. Recreation storage will be 59 acre feet, and sediment capacity will total 609 acre feet, based on a 100-year accumulation. The diversion and

inlet structures and the excavated storage reservoirs will have the capacity to control the 100-year frequency flood. Flood flows in excess of a 100-year frequency will bypass the diversion structure. The mounds and reservoirs are planned in such a manner that the natural flood plain capacity will not be significantly reduced. The four structures will control floodwater runoff from 113.01 square miles, 53 percent of the total watershed area.

The four structures will require a total of about 322 acres of land for their installation. Some 140 acres will be used by the reservoirs, and 182 acres will be used for the diversion and inlet features, channel, spoil areas, and recreation areas.

The pumping plants will consist of multiple electric or hydraulic turbine pumps. Small pumps will maintain a constant permanent pool elevation. Larger pumps are sized to evacuate the excavated storage reservoir. The pumps have a minimum capacity to provide 100 percent draw down in 10 days. The pumping plants will be suitably housed for protection of their equipment and for maintenance. The pumping plants will be operated automatically by reservoir stage gages with automatic shut down override controls from downstream channel gaging points.

Excavated material removed from the reservoir area of structures will be mounded adjacent to the excavation and will be landscaped and shaped to blend into the surrounding topography. The reservoirs and mound areas will be vegetated and maintained for visual quality and to minimize erosion.

Channel Work

The channel work consists of 2.77 miles of earth channels, 0.38 miles of lined concrete channels (all in existing man-made or modified channels), and 0.93 miles of closed concrete conduit.

The earth and concrete channels will be constructed in the same alignment as the existing channels. The conduits for the most part will be located under existing streets.

The Calumet-Union Drainage Ditch Channel and the Midlothian Creek Channel are perennial streams, and the Natalie Creek Channel is an intermittent stream. The channel work will require some clearing of mature woody vegetation in the upper reaches of the Calumet-Union Channel, and some clearing of small woody vegetation on Midlothian Creek Channel and Natalie Creek Channel. There are long reaches, for example Station 120+76 to 167+20 of the Calumet-Union Channel, where there is no existing woody vegetation. The channel work will widen the existing channels but will not substantially increase their depths. Channels will be constructed generally in a dense silty clay and sandy silt material.

The channel improvement reach on Midlothian Creek from Station 28+10 to Station 40+00 has a relatively steep hydraulic gradient. Flow velocities are erosively high. Riprap will be necessary to stabilize the side slopes and the bottom of the channel. Gravel will be necessary to stabilize the bottom of Natalie Creek from Station 7+00 to Station 36+00.

The constructed channels are designed to carry the projected condition 100-year flood flow within banks. The Calumet-Union Channel and the Midlothian Creek Channel will have a substantial amount of drainage area above them controlled by floodwater retarding structures.

The spoil excavated during the construction of these channels for the most part will be removed from the construction area and hauled to Structure Site 53. The channel banks and berms will be seeded to grass immediately after construction to minimize erosion.

Construction for all structural measures will be carried out in a way to minimize water and air pollution. Construction methods will include special features to assure that state and federal EPA standards are met and to assure compliance with local sediment and erosion control ordinances.

Some of the special features that will be required are temporary debris basins; vegetation of the spoil piles as they are constructed; watering of haul roads; disposal of debris by burying or chipping; and protection against pollutants such as chemicals, fuels, sewage, etc. from entering the stream channels.

Provisions of Public Law 86-523 relating to the preservation of historical and archaeological data will be followed. Investigations indicate that installation of the project will not disturb any archaeological value or historical place. However, should any evidence of historical or archaeological materials be uncovered during construction, the Illinois Historical Preservation Officer and the National Park Service will be notified.

Construction Sequence

Construction sequence is optional except as follows: Structure 53 must be constructed before the Calumet-Union Drainage Ditch channel work. Structure 32 and the Midlothian Creek channel work must be completed before the Natalie Creek channel. Structure 32 should be constructed before the Midlothian Creek channel modifications.

Cost of Structural Measures

The total installation cost of the Selected Plan structural measures is estimated to be $30,647,800. The installation costs are divided into the following sub-units: construction, engineering, land rights, and project administration. These costs are tabulated for each plan measure in Table 1, page 103.

Construction costs are the engineer's estimate of the cost of all material, labor, and equipment involved in construction. Unit costs are based on current unit prices for similar construction work recently completed in the Chicago area. A contingency allowance of 12 percent has been added to the construction cost to defray unforeseen costs that might be incurred during construction. Additional costs have been included to stabilize reservoir slopes and bottoms in which sand or peat are exposed in the excavation. Construction costs include such items as clearing, excavation, earth fill, concrete pipe, seeding, fencing, and pumping plants. Construction costs do not include such items as utility modifications, bridge construction, and pavement replacement.

Engineering costs are those costs incurred by engineers, geologists, and other technicians for survey, design, geologic investigations, and preparation and interpretation of plans and specifications. Engineering costs do not include the design cost incurred for utility, road, or bridge modifications.

Land rights costs include the cost of acquiring all land needed for the structural measures. These costs also include survey fees and legal fees incurred in obtaining the needed land. Land rights costs also include the construction and engineering costs associated with road, bridge, and utility modifications.

Project administration costs are those costs associated with the installation of the structural measures. Included in this cost is the cost of contract administration and necessary construction inspection.

Implementation

The sponsor(s) of this plan will prepare an "Implementation Program" providing for implementation of the selected plan. This document will set forth the names and responsibilities of each sponsor and involved agency in (1) enacting the non-structural programs, (2) obtaining land rights, (3) sponsoring project installation, and (4) sustaining an operation and maintenance program. This document will detail distribution of local responsibilities required for implementing the total plan.

Local sponsoring organizations will (1) fully implement the non-structural programs, (2) provide necessary easements and land rights for project installation, (3) administer construction contracts, and (4) assume responsibility for operating and maintaining structural measures and non-structural measures.

They may seek funds to defray all project construction costs, provide for all project engineering costs in the design, preparation of specifications, inspection of construction, execution of certificates of completion, and related tasks for the installation of the project measures.

Operation and maintenance provisions for the excavated floodwater retarding structures, the multiple purpose structure, and the channel work will be required to assure proper functioning of these structural measures. The operation of excavated floodwater retarding structures will include the power requirements to pump stored floodwater and groundwater seepage out of the reservoir. Operational control will be automatic from downstream flow gages and/or reservoir gages. Maintenance consists of monthly inspection visits, motor and pump repairs, building repairs, trash removal, mowing of reservoir and spoil areas, and diversion and inlet structure repairs. The maintenance of the channel work will consist of reseeding, mowing of banks and berms, debris removal, clean-out of sediment and woody vegetation, and repairs to riprap, concrete channel linings, conduits and inlet structures. Maintenance may also require replacement of gages, motors, pumps, and/or other such features.

EFFECTS OF INSTALLING THE SELECTED PLAN

National Economic Development Account (NED):

The selected plan measures will provide approximately $3,064,500 of flood control benefits annually. About $2,446,900 of this results from reduction of damages to residential properties, $43,500 from business and commercial properties, $63,400 from reduced traffic disruption and $510,700 from reduced associated damages.

Projected average annual flood damage to residential properties will be reduced by 99 percent; 100 percent of commercial damage will be eliminated; traffic disruption will be reduced by 64 percent, and associated damages will be reduced by 98 percent. Total flood damages in the study area will be reduced nearly 98 percent.

The recreational facilities associated with multiple purpose Structure 32 will provide $87,800 of recreation benefits annually. The recreation benefits are based on 43,700 user-days annually, primarily by local residents.

The planned land treatment program will provide widespread benefits including reduced cost of sediment removal from streets, storm sewers, channels, drainage ditches, downstream reservoirs, and navigation channels. Monetary benefits from the land treatment program were not determined.

The total cost of installing the proposed structural measures is estimated to be $30,647,800. Construction cost is estimated to be $19,448,000. Engineering costs are estimated to be $1,474,000. Cost of land rights are estimated to be $8,162,000. Land rights costs include the value of land, bridge replacements, utility modifications, and repaving streets.

Project administration costs are estimated to be $1,563,800. Project administration includes costs necessary to administer contracts and provide construction inspection.

Average annual operation, maintenance, and replacement costs of structural measures are estimated to be $107,400. These costs provide for the necessary maintenance, repair, and replacement of structural measures to assure proper functioning for the 100-year evaluation period.

Maintenance of existing stream channels is estimated to cost $38,000 annually. These costs are to provide the necessary maintenance to assure adequate channel capacities in the future.

The recreation facilities associated with multiple purpose Structure 32 are estimated to cost $101,800. Operation, maintenance, and replacement of recreation facilities is estimated to cost $4,400 annually.

The flood plain regulation program is estimated to cost $62,500 annually.

The flood proofing program is estimated to cost $7,000 annually.

The planned land treatment program is estimated to cost $86,100 annually. The continuous technical assistance necessary to prepare resource plans and assure proper installation of land treatment systems is estimated to cost $25,800 annually.

Total annual NED costs necessary to install, operate, and maintain the selected plan measures are estimated to be $2,133,500. Total annual NED benefits are estimated to be $3,152,300, resulting in $1,018,800 of net NED benefits.

Regional Development Account:

All flood control ($3,064,500) and recreation ($87,800) benefits accrue within the Chicago metropolitan region without any loss to the rest of the nation. Regional benefits accruing because of (1) employment during installation, operation and maintenance, and (2) externalities resulting from expenditures by users of the recreation development do not contribute beneficially to the rest of the nation.

Regional benefits resulting from employment during construction are estimated to be $228,400 annually for the 10-year installation period. About 26 jobs will be available on the project during the installation period. Operation and maintenance of the structural measures will provide approximately $41,200 annually in regional benefits to local wage earners. About 3.5 permanent jobs will be provided.

Total resources contributed from within the region and from the rest of the nation are estimated to be $2,133,500 annually. Beneficial effects accruing within the region are estimated to be $3,430,700 annually.

Cost Allocation:

(A) Allocation of National Economic Development costs among objectives -

NED Objectives	Modified NED Plan	Recommended Plan C	Difference
Benefits	$3,124,700	$3,152,300	$ 27,600
Costs	$1,865,300	$2,133,500	$ 268,200
Net Incremental NED Cost			$ 240,600
Total NED Cost of Plan C			$2,133,500
Less Incremental NED Cost			$ 240,600
Allocation of NED Costs of Plan C to NED Objective			$1,892,900

(B) Allocation of NED Costs among components of NED Objectives -

The separable costs-remaining benefits method of cost allocation was used to allocate costs among components in Structure 32. Annual costs for Structure 32 total $258,200. Cost allocated to flood prevention are 78.2 percent, or $201,900, while $56,300 or 21.8 percent is allocated to recreation. Costs for all other structural measures are allocated to flood prevention.

Environmental Quality Account:

Installation of project measures will produce both beneficial and adverse environmental effects. Environmental effects are described and physically quantified where practical. No attempt is made to assign monetary values to environmental effects.

Installation of structural measures will require the temporary disturbance of vegetation on 200 acres. Erosion and sedimentation along with noise and dust will increase during construction. About 302 acres of public open space will be preserved. Sediment pools, recreation pools, and borrow areas will provide 71 acres of water capable of supporting fish life and waterfowl resting and feeding areas. Approximately 4,000 GPM of low flow will be added to streams. The water table near excavated structures will be lowered.

Approximately 0.38 miles of earth channel will be converted to concrete lined channel. About 41 acres of land will be permanently committed to sediment pools and 15 acres will be committed to a recreational pool.

Installation of planned measures will reduce average annual floodwater damages by nearly 98 percent. The effect of project measures on reducing the extent of flooding is illustrated as follows: 100-year frequency flood -- acres flooded without project - 10,800; acres flooded with project - 4,900.

Installation of planned measures will reduce the occasional surcharge of the Calumet River into Lake Michigan. This will assist in minimizing the flow of wastes into the lake and is fundamental to minimizing eutrophication of the lake.

The planned measures will likewise significantly decrease projected condition peak runoff rates in the watershed. Estimated discharges on Thorn Creek, at its confluence with the Little Calumet River, are as follows:

Frequency	Peak Discharge Without Project	Peak Discharge With Project
10-year	4,364	1,608
100-year	7,520	1,706

Estimated discharges on Calumet Union at South Park Avenue south of 159th Street are as follows:

Frequency	Peak Discharge Without Project	Peak Discharge With Project
10-year	931	615
100-year	1,392	817

Similar estimates of discharges for two locations on the Midlothian Creek are as follows:

1. Harlem Avenue (North of 171st Street) -

Frequency	Peak Discharge Without Project	Peak Discharge With Project
10-year	506	300
100-year	900	378

2. Kedzie Avenue (North of 139th Street) -

Frequency	Peak Discharge Without Project	Peak Discharge With Project
10-year	426	121
100-year	1,392	434

Discharges on North Creek at Torrence Avenue north of Lansing Road are estimated as follows:

Frequency	Peak Discharge Without Project	Peak Discharge With Project
10-year	589	298
100-year	1,019	413

Areas inundated by the projected condition 100-year frequency flood for both with and without project conditions are shown on the flood plain topographic maps prepared during this study. Profiles of flood elevations for the respective flooding conditions are shown on the reverse side of each map sheet. (See sample at the back of this report.)

The non-structural measures will preserve 3,900 acres of floodway along 109 miles of streams. The aesthetic qualities of the streams and their environs will be preserved and enhanced. The elimination of construction in the floodway will help reduce extraneous flow of surface water into sanitary sewer systems.

Channel maintenance will reduce future flood stages by maintaining stream capacities. Debris removal will improve hydraulic conveyance and will make the streams more attractive for recreational uses such as canoeing. The stream ecology will be improved and the environmental quality of the channel corridor will be enhanced.

The planned land treatment systems will reduce erosion rates on cropland and idle land from an average of 8.4 tons per acre per year to 2.8 tons per acre per year. Average sediment yields on land being converted to urban uses will be reduced from 11.0 tons per acre per year to 2.0 tons per acre per year. About 52,700 cubic yards of sediment will be prevented from entering streams each year, thus maintaining their capacities and reducing the turbidity levels of streams and reservoirs.

Resource planning assistance will provide necessary data for more compatible urban development. Data will be available for proper utilization and preservation of environmental resources. Potential problems associated with urban development on unstable and wet soils will be identified. The overall aesthetic qualities of the study area will be improved by reducing runoff, erosion, sedimentation, and protection of vegetative cover.

The National Park Service and the Illinois Historical Preservation Officer were notified of the intent of this plan. An archaeological survey was conducted through the Illinois Archaeological Survey of all areas that would be involved in construction of excavated floodwater structures. This survey indicated that no prehistoric or historic sites were in the immediate vicinity of the proposed structures. The National Register of Historic Places also did not list any sites within these construction areas. In accordance with Public Law 93-291, should specimens be found during construction, the Illinois Historical Preservation Officer and the National Park Service will be notified and will be given the opportunity to evaluate and salvage such items as desired.

Social Well-Being Account:

Social well-being effects accruing as a result of project measures can be divided into the following categories: (1) income distribution; (2) life, health, and safety; and (3) recreational opportunities. These effects accrue within the Chicago metropolitan region.

Operation and maintenance of project measures will provide 3.5 permanent jobs. A regional income of $3,511,100 will be generated by project measures. Beneficiaries of the regional income can be divided into the following family income classes:

0 - $10,000	8 percent
$10,000 - $15,000	90 percent
$15,000+	2 percent

Each year about 7,300 travel disruptions will be eliminated by project measures. Several arterial streets, which are also state highways, will receive a significant reduction in the frequency of closure. Traffic disruption costs caused by flooding will be reduced by 64 percent.

About 6,710 residences and 142 businesses will be protected from the projected 100-year flood. An additional 1,400 residences and 30 businesses will be affected by removing floodwaters from lawns, streets and parking lots. Owners of 239 residences will receive technical assistance to assist with floodproofing measures.

Health hazards caused by inundation of residences, yards, and streets with polluted floodwaters will be reduced. The risk of drowning during flood events will be reduced.

The recreation storage and facilities associated with multiple purpose Structure 32 will provide an estimated 43,700 user-days of recreation activities annually. The 15 water surface acres will be available, as well as an additional 40 acres of land for land based activities.Recreation experiences available include boating, canoeing, and fishing. Land areas will be used as playgrounds for both summer and winter activities.

Intensive recreation activity will create additional hazards to human life induced by increased traffic and drowning possibilities. Noise levels and dust concentrations will increase.

General:

Installation of structural measures will require disturbance and commitment of land resources for construction, operation, and maintenance purposes. Present land use and stream miles modified for the planned structural measures are shown on the following page.

PRESENT LAND USE AFFECTED BY SELECTED PLAN

Structural Measure	Total Area Used	Stream Modification	Stream Classification	Developed Land	Undeveloped Land		
					Idle Land	Agricultural Land	Water
	Acres	Miles		Acres	Acres	Acres	Acres
Structure 32	118.0	0.27 4/	Intermittent	-	61.0	57.0	-
Structure 53	73.5	0.10 4/	Intermittent	-	20.0	53.5	-
Structure 84	50.0	0.10 4/	Perennial	50.0 1/	-	-	-
Structure 143	80.0	0.10 4/	Perennial	53.9 2/	-	26.1	-
Midlothian Creek Channel Work 137th St. to 139th St.	-	0.23	Perennial	-	-	-	-
Diversion Conduit 139th St. to Calumet-Sag Channel	1.4	-	Perennial	1.4 3/	-	-	-
Natalie Creek Conduit Crawford to Hamlin and 145th	0.8	-	Intermittent	0.8 3/	-	-	-
Natalie Creek Channel Work Hamlin and 145th to Midlothian Creek	-	0.68	Intermittent	-	-	-	-
Calumet-Union Drainage Ditch Channel Work Western Ave. to Halsted	-	1.99	Perennial	-	-	-	-
TOTAL	323.7	3.47		106.1	81.0	136.6	-

1/ Limestone Quarry
2/ Sand Mine
3/ Streets and Residential
4/ Modifications incidental to structure installation

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SELECTED PLAN

Table 1 - ESTIMATED STRUCTURE INSTALLATION COST DISTRIBUTION

Little Calumet River Watershed, Illinois

(Dollars)[1/]

Item	Construction	Engineering	Land Rights	Project Administration	Total
Multiple Purpose Structure No. 32	3,250,000	244,000	493,000	260,000	4,247,000
Recreation Facilities	80,000	16,000		5,800	101,800
Excavated Floodwater Retarding Structures: No. 53	1,730,000	130,000	1,000,000	140,000	3,000,000
No. 84	9,977,000	750,000	5,800,000	800,000	17,327,000
No. 143	1,830,000	140,000	560,000	150,000	2,680,000
Subtotal	16,867,000	1,280,000	7,853,000	1,355,800	27,355,800
Channel Work: Midlothian Channel	770,000	58,000	67,000[4/]	62,000	957,000
Natalie Creek	946,000	71,000	75,000[3/]	76,000	1,168,000
Calumet Union Channel	865,000	65,000	167,000[2/]	70,000	1,167,000
Subtotal	2,581,000	194,000	309,000	208,000	3,292,000
GRAND TOTAL	19,448,000	1,474,000	8,162,000	1,563,800	30,647,800

1/ Price Base 1974
2/ Includes 67,000 for bridge replacement and 50,000 for utility modifications.
3/ Includes 35,000 for repaving streets and 25,000 for utility modifications.
4/ Includes 27,000 for repaving streets and 25,000 for utility modifications.

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SELECTED PLAN

Table 1a - ESTIMATED COST OF SELECTED PLAN MEASURES
Little Calumet River Watershed, Illinois

(Dollars)[1/]

Measure	Installation Cost	Average Annual Cost [2/]
STRUCTURAL MEASURES		
Multiple Purpose Structure No. 32	4,247,000	250,400
Excavated Floodwater Retarding Structure Nos. 53, 84, and 143	23,007,000	1,356,300
Channel Work	3,292,000	194,000
Structural Measure OM&R	-	107,400 [3/]
Recreation Facilities	101,800	6,000
Subtotal	30,647,800	1,914,100
NON-STRUCTURAL MEASURES		
Existing Channel Maintenance Program	-	38,000
Land Treatment Program		
Installation (Annual)	-	86,100
Technical Assistance	-	25,800
Flood Plain Regulation Program	-	62,500
Flood Proofing Program	-	7,000
Subtotal	-	219,400
TOTALS	30,647,800	2,133,500

1/ Price Base 1974
2/ 100 years @ 5 7/8 percent interest
3/ Includes $4,400 OM&R for recreation facilities (Structure No. 32)

May 1975

SELECTED PLAN

Table 2 - STRUCTURE DATA

Excavated Floodwater Retarding Structures

Little Calumet River Watershed, Illinois

Item	Unit	Structure Number 32	53	84	143	Total
Drainage Area	SqMi	5.87	4.34	94.19	8.61	113.01
Controlled	SqMi	-	-	8.61	-	8.61
Runoff Curve No. (1-day) (AMCII)		78	77	78	76	
Time of Concentration	Hrs	6.0	5.4	16.3	8.6	
Elev.Inlet Str.Crest (Straight Drop)	Ft	-	-	582.7	622.3	
Elev.Inlet Str.Crest (Chute Spillway)	Ft	685.5	609.5	-	617.3	
Elev.Flowline Diversion Str. Orifice	Ft	-	605.5	-	617.0	
Elev.Retarding Pool (Bottom)	Ft	666.2	592.0	361.6	587.0	
Elev.Retarding Pool (Top)	Ft	691.2	616.0	596.6	627.0	
Max. Depth of Excavation	Ft	28.5	28.0	350	67	
Volume of Excavation	10^3 cy	974	720	-	-	
Total Storage Capacity	AcFt	651.7	566.8	9595.0	1034.2	11847.7
Recreation	AcFt	58.5	-	-	-	58.5
100-year Sediment	AcFt	14.2	27.8	522.0	45.2	609.2
Retarding	AcFt	579.0	539.0	10117.0	994.0	12229.0
Surface Area	----					
Recreation Pool	Ac	12.7	-	-	-	12.7
Sediment Pool	Ac	-	6.0	-	34.6	40.6
Retarding Pool (Top)	Ac	33.3	27.3	46	33.0	139.6
Retarding Pool (Bottom)	Ac	14.0	17.6	40	16.7	88.3
Total Area Needed	Ac	118	73.5	50.0	80.0	321.5
Rainfall Volume	----					
1-day	In	5.80	5.80	5.80	5.80	
10-day	In	10.10	10.10	10.10	10.10	
Runoff Volume (10-day)	In	5.25	5.11	5.25	4.98	
Structure Capacity	----					
Diversion Str. Orifice	cfs	200	100	1500	150	
Inlet Structure	cfs	683	806	6244	893	
Structure Sizes						
Straight Drop Length	Ft	-	-	-	50	
Straight Drop Overfall	Ft	-	-	-	5.0	
Chute Width	Ft	16	20	-	18	
Chute Flow Depth	Ft	5.8	5.6	-	6.4	
Pumping Plant	----					
Head	Ft	25	24	235	40	
Capacity	cfs	30	27	490	50	
Capacity Equivalents	----					
Sediment Volume	In	0.05	0.12	0.10	0.10	0.10
Retarding Volume	In	1.85	2.37	2.08	2.14	2.03

SELECTED PLAN

Table 2a - STRUCTURE OATA

Channels

Little Calumet River Watershed, Illinois

Station	Uncontrolled Orainage Area (Sq.Mi.)	1/ Bottom Width (ft)	Aged Condition (100-yr. flow) Oesign Capacity (cfs)	Hydraulic Gradient (ft/ft)	Oepth of Flow (ft)	2/ Velocity (ft/sec)	As Built Condition (10-yr. flow) Oesign Capacity (cfs)	Hydraulic Gradient (ft/ft)	Oepth of Flow (ft)	3/ Velocity (ft/sec)	Excavation (cu.yd.)	4/ Type of Work	Before Project 5/ Type of Channel	Before Project 6/ Flow Condition
Midlothian Creek Channel:														
0+00 to 28+10	7.50	-			84-inch	Conduit	400 cfs Capacity							
28+10 to 40+00	7.50	30	798	0.0013	5.6	3.46	423	0.0013	3.0	3.92	11,000	III	M(1955)	Pr
Natalie Creek Channel:														
1+00 to 7+00	4.05	12	426	0.0005	6.6	5.46	340	0.0005	5.4	5.13	6,000	I	M(1960)	I
7+00 to 36+00	4.05	14	382	0.0005	6.6	2.13	300	0.0005	4.8	2.88	31,750	II	M(1960)	I
36+00 to 57+00	3.40	-		10 ft. x 5	ft. R/C Box Conduit		300 cfs Capacity							
Calumet-Union Orainage Oitch Channel:														
83+37 to 107+47	7.67	16	881	0.0005	9.5	2.64	650	0.00039	7.6	2.82	15,100	II	M(1925)	Pr
107+47 to 120+76	4.47	30	787	0.0005	8.0	3.58	600	0.00009	5.6	3.59	3,900	I	M(1925)	Pr
120+76 to 150+08	4.47	32	787	0.0003	8.0	2.05	600	0.00030	5.5	2.51	22,000	II	M(1925)	Pr
150+08 to 162+98	4.47	28	704	0.0003	8.0	2.00	400	0.00020	5.3	1.90	9,000	II	M(1925)	Pr
162+98 to 167+20	3.28	40	940	0.0003	8.0	2.10	550	0.00014	5.3	1.99	4,400	II	M(1925)	Pr
167+20 to 188+48	2.28	14	439	0.0003	8.0	1.84	280	0.00023	5.3	2.11	1,800	II	M(1925)	Pr

1/ Side slopes 2:1 on earth channels and vertical on concrete channels.
2/ Aged condition velocities computed using "n" = 0.040 for earth channels and 0.013 for concrete channels.
3/ As built velocities computed using "n" = 0.025 for earth channels and 0.013 for concrete channels.
4/ Type of work: (Type III) Enlargement of existing channel with riprap lining; (Type II) Enlargement of existing channel; (Type I) Concrete lined channel.
5/ Type of channel: M(1902) Man-made channel and approximate date of original construction.
6/ Flow condition: (I) Intermittent; (Pr) Perennial

May 1975

INVESTIGATIONS AND ANALYSES

Economics

Floodwater Damage - Residential Property:

Damage to home furnishings and personal effects together with costs for cleaning, renovation, and repairs constitute the largest portion of floodwater damage. Estimated damage to individual residences, businesses, and business places is computed on the basis of type of construction, market value, elevation, and location within the flood plain.

Field surveys were made to determine first floor and low water entry elevations for a total of 4,277 single family homes, mobile homes, and multiple family buildings. Elevations were also surveyed on 338 business establishments and miscellaneous structures, i.e., churches, schools and public buildings. Field surveys were stipulated to provide data on either a 100 percent basis or a 20 percent sample of residences in flood prone areas depending on the extent of area involved, intensity of development, and variety in type of construction.

A total of 551 residential buildings were surveyed on a 100 percent basis in the Butterfield Creek, Thorn Creek, North Creek, and Deer Creek tributaries.

Field surveys in the Calumet Union, Midlothian Creek, and Little Calumet River (main stem) flood plains were based on a 20 percent sample. A total of 3,906 residential properties were surveyed in these three areas.

Type of construction with reference to lowest level of a building, i.e., basement, split level, bi-level raised ranch, or non-basement was denoted for each building. Individual buildings were assigned a valley station number corresponding to their position along the valley and flood profiles.

Realtors were contacted regarding current real estate values. Information from these sources, supplemented by field reconnaissance and reference to Olcotts Land Values, Bluebook of Chicago, was used to estimate current market values for all surveyed properties in flood prone areas.

Field interviews with flood plain homeowners were made to estimate depth-damage relationships and the frequency of past floods. Information from interviews together with data from Soil Conservation Service and Federal Insurance Administration studies were used to develop stage-damage relationships for each of the six different types of residential properties.

Damageable values were projected based on an index developed from the Water Resource Council's OBERS Projections. The index developed was based on the relationship of projected (year 2000) and 1970 "earnings per worker".

A damage evaluation program (SCS-URB-1) was used to calculate residential floodwater damages. Computer output identifies individual buildings flooded, indicates the number of buildings flooded by frequency, summarizes damages by frequency, and totals average annual damages by evaluation reach.

Damage caused by sewer backup was not considered in the establishment of depth-damage curves nor was it included in the floodwater damage evaluation because overloading of combined sewers is not always directly related to overbank flooding.

Floodwater Damage - Business Property:

Depth-damage relationships were developed for ten types of businesses based on data from Technical Note No. 21, Fort Worth E&WPU and a Stanford Research Institute study A Study of Procedure in Estimating Flood Damage to Residential, Commercial and Industrial Properties in California. Average annual damages were calculated using the SCS-URB-1 program as outlined under "Floodwater Damage - Residential Property".

Floodwater Damage - Traffic Disruption:

Traffic disruption costs include charges for the driver's time lost and additional vehicle operating costs caused by detours. These costs are estimated to be $8.70 per hour for each vehicle detoured.

Estimates of daily traffic count on major roads were taken from Cook and Will County Highway Traffic Maps provided by the Illinois Department of Public Works and Buildings, Division of Highways.

Field surveys were made to determine road elevations. Flood depths of less than 6 inches were assumed to cause a 50 percent road closure while depths of over 6 inches were assumed to cause a complete closure. Duration of closure was estimated from a review of flood hydrographs.

The SCS-URB-1 program was used to calculate average annual damages. Traffic flow is estimated to increase 143 percent by year 2000. This is based on Illinois Department of Transportation estimates of a 3 to 5 percent annual growth in traffic.

Associated Flood Damages:

Included in this category of damages are items such as loss of employment due to traffic disruption, reduced use of lower floor space following repeated flooding, motel and meal expenses incurred because of flooding, flooded streets, incidental lawn and garden damage, and public and private costs for the collection and disposal of garbage. Associated damage is estimated to be 20 percent of combined residential, business and traffic disruption damages.

Projected Damages:

Estimates of future floodwater damage represent damages to existing development with a projected damageable value at the year 2000, the approximate economic midpoint of a 100-year evaluation period. Damages were calculated assuming projected hydraulic and hydrologic conditions. Projected damage to existing improvements caused by further urbanization of the watershed are included in the floodwater damages.

Hydrologic and Hydraulic

Hydraulic Analyses:

Extensive investigations in the form of channel and valley cross sections have been made by a number of agencies over the past 15 to 20 years. These existing surveys were supplemented to complete the hydraulic analyses. The following table shows the primary source of survey data on each tributary and the approximate date of the surveys:

Tributary Channel	Surveying Agency	Approximate Date of Survey
Midlothian Creek	U.S. Army Corps of Engineers and State of Illinois Division of Waterways	1961 1963
Cal-Union Drainage Ditch	Soil Conservation Service	1972
Butterfield Creek	State of Illinois, Division of Waterways	1964
Thorn Creek	State of Illinois, Division of Waterways	1953
Deer Creek	State of Illinois, Division of Waterways	1964
North Creek (Lansing Ditch)	Soil Conservation Service	1972
Hart Ditch (Plum Creek)	U.S. Army Corps of Engineers	1961 1973
Cady Marsh Ditch	Soil Conservation Service	1972
Little Calumet River (Main Stem)	U.S. Army Corps of Engineers	1961

All available survey data were evaluated and supplemented where necessary. A total of 251 valley cross sections were utilized along with 54 road profiles and bridge openings. Vertical control for all surveys was tied to mean sea level. The locations of these valley cross sections were selected using two-foot interval topographic maps, historic flood profiles, and field reconnaissance. These surveys represent typical channel and valley configurations as well as isolated obstructions to flood flows.

The SCS computer program (WSP2) was utilized to run successive water surface profiles for a wide range of discharge rates. Head losses at bridges, culverts, and overtopped roads were included in these computations. Output data included stage discharge relationships for all valley cross sections and roadways surveyed.

Verification of a hydraulic computation was accomplished by comparing computed rating information with USGS rating measurements. Final correlation was accomplished by adjusting channel and valley roughness coefficients and backwater conditions.

Hydrologic Simulation Model:

Preceding this study, work was done by the U.S. Army Corps of Engineers, Chicago District, and the Department of Natural Resources in Indiana. This work provided regionalized unit hydrographs from historic flood events. These regionalized unit graphs were adapted for use in the simulation of floods in the Little Calumet River Watershed. This unit graph provided good reproduction of historical floods at all gage locations within the Little Calumet River Watershed. Therefore, it was determined that these proportions be used in the evaluation model.

The Little Calumet River Watershed was subdivided into 163 subwatershed areas ranging in size from 1/2 square mile to 5 square miles. Approximately 77 square miles in the northern portion of the watershed are included in the combined sewer area. The City of Chicago routings indicate that the Tunnel-Reservoir Project will intercept all significant flows from this part of the watershed. Therefore, the hydrologic model excludes the combined sewer area.

The runoff characteristics of each subwatershed area in the hydrologic model were considered separately. The parameters which were considered are: soils, land slope, overland flow length, channelized flow length, channelized flow velocity, land use, past rainfall, runoff, and antecedent moisture condition. These parameters were then used in determining hydrologic curve number in each subwatershed, and the time of concentration for that subwatershed area. Resulting time of concentration and curve numbers were then tested in a historical storm situation. Adjustments were then made in time of concentration so that the historic flood profile and gaged hydrographs could more nearly be duplicated.

Precipitation data from U.S. Weather Bureau Technical Paper 40 was utilized for evaluation of this watershed. The following table summarizes the 24-hour duration rainfalls used in the hydrologic analyses:

	Frequency of Occurrence				
	100-year	25-year	10-year	5-year	2-year
Rainfall in inches	5.8	4.7	4.1	3.6	2.8

Flood Profile Development:

The hydrologic evaluation model generates discharges at 160 points throughout the Little Calumet River Watershed. Therefore, it was necessary to further break down these point discharges in order to determine the discharges at each individual cross section or roadway. These values were straight line interpolated from a log-log plot of drainage area versus discharge at each location for each frequency.

Water surface (flood profiles) were then plotted with elevations determined from combining the above discharge data with rating curves developed in the hydraulics phase. These data are used in economic evaluation and flood plain delineations.

Assumptions for the Without Project Evaluation:

Assumptions on changes in channel sizes and capacities for the without project evaluation are extremely complex. Some of the complicating factors are:

a. Random but often significant flood plain modifications.

b. Uncoordinated planning and construction of channel modification.

c. The active road building program which caused both modification and construction of new bridge openings and road crossings.

The following policy was adopted as a reasonable approach to solving these uncertainties. Where public entities have authorized and/or funded flood plain modifications, channel improvements, or road crossing alterations, these were considered in place. In all other evaluation areas, the without project condition was assumed to be the same as the present condition.

Flood Routing:

Utilizing Northeastern Illinois Planning Commission projections and local zoning maps, land use was projected to the year 2000 for the purpose of generating runoff peaks and volumes reflecting expected land use changes. Runoff curve numbers were increased to reflect the projected land use. Times of concentration were reduced to reflect the improved drainage systems which accompany urban development.

Village officials in the watershed indicate they plan to utilize compensatory storage regulations in the development of some flood plain lands. Under this scheme, filling of flood plains is allowed if the fill material comes from another part of the flood plain. In the Little Calumet River Watershed, this type of development will not greatly improve the hydraulic efficiency in the upper reaches of the watershed. It was determined that the impact of compensatory storage could only have a minor adverse effect on the lower reaches. (The filling of flood plains without providing compensatory storage would cause a significant adverse impact.)

Therefore, the without project flood routings assume compensatory storage will be provided for flood plain development and reflect only upland development. This development represents an average watershed condition in the year 2000. Flood profiles from these routings were used to define the extent and elevation of the projected 100-year flood on the flood plain topographic maps.

Five floods ranging from 2-year to 100-year frequency events were routed for the without project condition. Peak discharges from these routings were the basis for further economic analyses.

The State Department of Transportation, Division of Waterways, reservoir located on Midlothian Creek at Cicero and 163rd Street and the Metropolitan Sanitary District's flood detention reservoir on Cherry Creek located at 171st Street were considered in place during the without project evaluation. However, the impact of on-site detention in reducing main stem flooding was not considered significant.

Division of flows at the mouth of Hart Ditch was based on the eastward and westward flow capacities of the Little Calumet at the present time. The obstructions to the easterly flow are more pronounced at the lower discharges (less than 1,000 cfs). Once floodwaters begin to overtop Indianapolis Boulevard and the railroad tracks directly upstream, eastward flow becomes unrestrained. Westward flow dominates for the smaller discharges (less than 1,000 cfs), but due to tailwater conditions induced by Thorn Creek and insignificant valley flow, westward flows are very constrained for the higher discharges. If channel improvements to the east were made extensive, then frequent reversals of Thorn Creek water would occur and additional capacities would need to be provided for this new source of floodwaters. (The Corps of Engineers plan for the Indiana portion of the Little Calumet River provides control gates west of the mouth of Hart Ditch to insure that floodwaters in Indiana flow toward Burns Ditch.)

Project Formulation:

The Little Calumet River Watershed is subdivided into four evaluation units. These subdivisions are Midlothian Creek, Calumet-Union Drainage Ditch, Thorn Creek and all its tributaries, and the Little Calumet River main stem with Hart Ditch and its tributaries. This subdivision was made in order to facilitate working with local interest groups. Hydrologically, these separate evaluations were made without sacrificing the comprehensive nature of the formulation process. The following procedure was repeated for each of the evaluation units listed above. Solutions to the problems and needs were generated. Each proposed solution or measure was evaluated with the hydrologic simulation model. Each measure was analyzed for its ability to reduce flood peak discharges and runoff volumes, its impact on the nature of floods, and its compatability with the overall storm drainage system in the watershed.

Various measures were combined to form alternative floodwater management systems. Each alternative system was tested by flood routing the same evaluation series.

Floodway Delineation:

Initially the with project 100-year flood profile and flood plain area were defined. Floodway delineation was made following the State of Illinois Flood Plain Regulation allowing an insignificant rise in water surface. This type of encroachment results in only minor accelerations of flow velocities and loss of storage. Under field conditions, it is assumed there would be no measureable impact on the calculated flood profile. It is also assumed that compensatory storage requirements will be met for any development which takes place on the floodway fringe, thus maintaining the integrity of the calculated flood profile.

The maximum encroachment limits were computed for each reach. These limits were then transferred to the flood plain topographic maps. In this operation, adjustments were made to reflect local variations in flood plain topography, existing obstructions and slack water areas which do not convey flood flows.

Engineering

Engineering Surveys:

Topographic maps were developed for the entire flood plain. The contouring was done at a 2-foot vertical interval on orthophotographic background. The selected structural measures in this plan for the most part fall within the mapped area. Structure 84, which is outside the area of the flood plain maps, has been contoured for the Deep Tunnel Plan of the City of Chicago and the Metropolitan Sanitary District of Greater Chicago. Contour maps and cross sections from the Illinois Division of Waterways were used for the design of the channel modifications along with cross sections obtained in this study. Some additional survey work will be necessary for final design.

Structure Design:

The structures were flood routed to determine 100-year frequency floodwater storage requirements for projected runoff conditions (year 2000). Storage requirements were determined by structure floodrouting 10-day mass runoff. Modified SCS NEH-4, Chapter 21, procedures were used for mass curve development. One day runoff (Q_1) was derived from the evaluation series whereas 10-day runoff (Q_{10}) was derived from the conventional curve number procedure. Structure freeboard was set at the elevation of the structure flood routed 500-year flood. The structures (reservoirs and spoil piles) were designed to insure that for a storm of greater magnitude than the design storm they would not significantly increase flood stages.

The inlet and diversion structures were designed to lower floodwater levels at least one foot for the 100-year frequency flood. The reservoir design crest elevation was set at an elevation equal to or lower than any upstream flood plain elevation to insure that no off-site area would have increased duration flooding.

Channel Design:

The channel modifications were designed to carry 100-year frequency flood flow as modified by floodwater retarding structures. The channels were protected with riprap where necessary to assure a stable channel in the as-built condition and also in the aged condition after vegetation has been established. The alignment of the channel modifications is the same as the existing man-made channels. Spoil for the most part will be removed from the channel construction area and disposed of at Structure 53.

Cost Estimates:

Land costs were based on estimates obtained from the 1973 edition of Olcott's Land Values. Construction cost estimates were based on unit prices of current construction in the Chicago area. Details of quantities, cost, and design features are listed in Tables 1 and 2 of this plan.

Pumping costs were determined by computing the total volume of water to be pumped at each site. Total volume was computed by integrating temporary flood storage and groundwater inflow for the design life of the structure. Pumping costs were computed using current power consumption rates. Replacement costs were computed from predicted total hours of pump life. The costs of periodic maintenance visits for lubrication and testing were added to this total.

Maintenance costs were computed for the structures and channel modifications. Costs computed for the structures consist of mowing the reservoir and spoil areas, debris removal, building and structure repairs, etc. Computed channel maintenance costs consist of mowing channel banks and berms, debris removal, sediment removal, and repair of channel vegetation.

Unit costs are estimates based primarily on similar work done by the Metropolitan Sanitary District of Greater Chicago and from Soil Conservation Service experience in Illinois.

Previous references to structure and channel design are general in nature. For a more detailed design analysis of structures and channels, see the structure design booklets. These booklets will be on file in the Flood Control Section of the Metropolitan Sanitary District of Greater Chicago.

Biology

An inventory of fish and wildlife resources was provided by biologists of Illinois Department of Conservation, Division of Fisheries and Wildlife Resources; Department of Interior, U.S. Fish and Wildlife Service; and the Soil Conservation Service. This inventory data was used in the plan formulation process. It provided information about location and quantity of fish and wildlife as well as fish and wildlife habitat resources, such as wetland and wooded areas.

Department of Conservation and SCS biologists also made a detailed field inventory and investigation to determine the effects of the proposed works of improvement on fish and wildlife resources. They also identified factors affecting the resources and their use such as land use changes, pollution, access to the resources, and management of the resources.

An evaluation of aquatic environments was made by Bauer Engineering, Inc. under contract with the Soil Conservation Service. This resource inventory and evaluation included the streams, lakes, and ponds in the watershed.

Geology

Erosion and Sedimentation:

An analysis of erosion in the study area was conducted using procedures described in SCS Technical Release No. 51. Basic soil loss rates for each of the Soil Associations in the study area were determined by use of the Universal Soil Loss Equation. (*20*) These rates were then prorated on an areal basis to determine equivalent rates for each of the major hydrologic subareas. Present and future condition land use and cover data, as determined by the Northeastern Illinois Planning Commission and field observation, were used to adjust the equivalent rates for various land use categories as listed below:

Built-up urban
Land under construction
Open urban public
Open vacant
Agricultural

The period for evaluation of soil loss was set at 30 years terminating at the year 2000. The relationship between present and future soil loss was assumed to be linear. Data for the year 1985 therefore yielded soil loss estimates representing an average for the evaluation period.

Sedimentation in the study area was examined by field observation. It was determined that significant measurable sediment damages occur predominantly adjacent to severe soil loss areas where sediment is deposited at changes in slope.

Structural Measure Investigations:

Sediment Storage - Sediment storage requirements for the four proposed excavated floodwater storage structures were estimated in accordance with SCS Engineering Memorandum-27, Technical Release No. 12 and Section 3 of the SCS National Engineering Handbook. Sediment yield by weight to each site, for each storm event, was estimated as the product of gross erosion, fraction of flow stored, and delivery ratio. This was converted to volume assuming a submerged unit weight of 50 pounds per cubic foot and an aerated unit weight of 75 pcf. Reservoirs with permanent pools were not considered to accumulate aerated sediment. Total 100-year storage was approximated by the area under the curve storm frequency vs. sediment volume.

Channel Work - Investigations of 2.9 miles of open channels were conducted with SCS Technical Release No. 25 as the principal guiding document. Basic data includes publications of the Illinois Geological Survey and information available from public and private agencies. Borings were made at 12 locations and visual inspections of exposures were made at 11 locations. Field logs along with index tests from 48 samples were used to develop stratigraphic profiles and stability reaches.

Investigations of 0.9 miles of closed conduit were also conducted. Information from 15 borings was used to develop stratigraphic profiles with major emphasis on delineating the bedrock surface.

Excavated Floodwater Storage Structures - Geologic investigations of four excavated floodwater storage structures were conducted. Principal guiding documents were Sections 8 and 18 of the SCS National Engineering Handbook. Basic data sources included well logs and publications of the Illinois Geological Survey and boring logs which were made available through other public agencies and private engineering firms. Structures 32, 53, and 143 were investigated by a private engineering firm under contract with SCS. On-site investigations included making 38 exploratory borings, establishing 7 observation wells and conducting specialized permeability and shear tests. Areas of investigation comprised both spoil disposal areas and floodwater storage areas. Geologic conditions were interpreted through the use of 9 geologic sections. Groundwater inflows and drawdown effects were estimated using Darcy's Law. Investigation of Structure 84 was accomplished by examination and interpretation of data and reports prepared for the Metropolitan Sanitary District Tunnel and Reservoir Plan by a private engineering firm.

Disposition of Data:

Geologic investigation reports and ancillary data are on file with the Metropolitan Sanitary District. Detailed geologic investigations will be required prior to final design of the structural measures included in this plan.

Recreation

An appraisal of existing recreation developments in the area was obtained from the Economic Research Service report entitled Outdoor Recreation Resources In The Chicago Metropolitan Area Cooperative River Basin Study. Recreation demand and use data was obtained from the Upper Mississippi River Basin Report. (*14*) Estimated user-day activity and design capacity of multiple purpose Structure 32 was taken from a plan developed for the recreation enterprise by the local park district. Values of recreation visits were obtained from the U.S. Water Resources Council's Principles and Standards For Planning Water and Related Land Resources (*18*) and used to calculate the recreational benefit of the water resource improvement of multiple purpose Structure 32.

ENVIRONMENTAL ASSESSMENT

Little Calumet River

Cook and Will Counties, Illinois

May 1975

ENVIRONMENTAL ASSESSMENT

Little Calumet River Floodwater Management Plan

Cook and Will Counties, Illinois

SUMMARY SHEET

Brief Description of Project Purpose and Action

A floodwater management plan is to be installed in Cook and Will Counties, Illinois. Project purposes are watershed protection, flood control and recreation. The project will include the following measures: land treatment, flood plain use regulations, flood proofing, channel maintenance, three excavated floodwater retarding structures, one multiple purpose structure (water resource improvement) and 3.8 miles of channel work.

Total installation cost of structural measures is estimated to be $30,647,800. Flood proofing and flood plain use regulations are estimated to cost $69,500 annually. Additionally, the cost of installing the land treatment systems is estimated to average $86,100 annually. Accelerated technical assistance to implement the land treatment measures is estimated to have an average annual cost of $25,800.

Summary of Environmental Impact and Adverse Environmental Effects

Sedimentation rates on urbanizing land will be reduced from 11 tons to 2 tons per acre annually. Erosion rates on cropland and idle land will be reduced from an average of 8.4 T/AC/YR to 3.8 T/AC/YR. Project measures will directly benefit 10,800 acres by reducing average annual floodwater damages by about 98 percent. The water resource improvement will provide the basis for 43,700 annual user-days of recreation.

Structural measures will preserve 324 acres of open space. Flood plain use regulations will restrict 3,900 acres of flood prone land to low hazard, low intensity uses. Construction of floodwater retarding structures will disturb vegetation on 218 acres during construction. In the reservoirs, 63 acres of terrestial habitat will be converted to sediment pools (water bodies) and 77 acres of detention pools will receive floodwater periodically. Vehicular traffic will increase in response to recreation use of Structure 32.

List of Alternatives Considered

(a) Conservation land treatment alone.

(b) A combination of non-structural measures.

(c) An alternative to optimize contributions to national economic development.

(d) Modified NED Plan to provide for the same management of the 100-year flood.

(e) An alternative to emphasize contributions to environmental quality.

(f) An alternative to provide countervailing benefits without channel work.

(g) No project action.

Agencies and Other Sources from which Comments have been Requested

Department of the Army
Department of Commerce
Department of Health, Education and Welfare
Department of the Interior
Department of Transportation
Environmental Protection Agency
Advisory Council on Historic Preservation
Illinois Historic Preservation Officer
Governor of Illinois
Illinois Office of Planning and Analysis
Illinois Task Force on Flood Control
Northeastern Illinois Planning Commission
Upper Mississippi River Basin Commission
Great Lakes Basin Commission

PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

ENVIRONMENTAL ASSESSMENT

For

Little Calumet River
Floodwater Management Plan

Cook and Will Counties, Illinois

The Floodwater Management Plan for this watershed was prepared by the Soil Conservation Service, U.S. Department of Agriculture, in cooperation with the Metropolitan Sanitary District of Greater Chicago and the Illinois Department of Conservation, under the authority of Section 6 of Public Law 566, 83d Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

PROJECT PURPOSES

Recognizing the primary goal as being floodwater management and the need for a coordinated plan for alleviating flood damage, the steering committee established the following objectives:

1. Implement a flood plain management program on 10,800 acres of flood plain lands.

2. Provide flood protection to 6,950 residences and 142 businesses.

3. Reduce erosion and sedimentation from 30,000 acres of crop and idle land and 2,000 acres under construction each year.

4. Provide 152,250,000 recreation user-day opportunities.

5. Enhance stream fishing in 60 miles of perennial stream.

6. Improve water quality in 109 miles of stream.

7. Provide 6,000 acres of public open space.

8. Protect 25,700 acres of existing wildlife habitat.

PLANNED PROJECT

Selected non-structural measures consist of a land treatment program, a flood plain management program, a channel operation and maintenance program and a flood proofing program. The annual cost of the non-structural program is $219,400.

Selected structural measures consist of three single purpose excavated floodwater retarding structures, one multiple purpose structure (floodwater storage plus recreational storage and associated facilities), and three sections of previously modified stream channel work totaling 3.8 miles. Total cost of the structural measures is estimated to be $30,647,800. Annual operation and maintenance costs are $107,400.

Land Treatment Program

The land treatment program for the Little Calumet River Watershed is divided into four general categories: (1) reduction of runoff, erosion, and sediment from construction areas, (2) erosion control systems on agricultural, idle, and forest land, (3) natural resource information and resource conservation planning assistance to land users and units of government, and (4) protection and aesthetic improvement of vegetative cover.

Accelerated technical assistance will be provided to local units of government and land users. It will include assistance to units of government in preparation of resource plans and their implementation through sediment and erosion control ordinances. Land users will receive assistance in conservation planning.

Approximately 1,000 acres of land under construction will need temporary treatment each year as development continues. Measures such as debris basins, diversions, and vegetative cover will be required to prevent excessive runoff, erosion, sedimentation and impaired visual quality. A comprehensive sediment and erosion control ordinance will be adopted by local units of government to achieve proper treatment of land being converted from agricultural, forest, and idle to urban uses.

Technical assistance will be provided to land users for application of land treatment measures. Conservation tillage and conservation cropping systems will be applied to cropland. Mechanical measures such as terraces, diversions and waterways will be utilized to accomplish erosion control on limited agricultural land. Permanent vegetation will be established on idle land.

Natural resource information and soil interpretations will be provided to decision makers for land use planning and installation of resource management systems. Technical data available will include inventories of wetlands, natural areas, critical erosion areas, and unique scenic areas. Soil limitation information for specific uses such as septic fields, urban development, intensive play areas, and agriculture are available.

The forestry program will require considerable acceleration of the federal-state cooperative forestry programs and/or employment of forestry consultants.The following annual forestry program is planned:

1. Urban forestry - Assist and cooperate with regional planning commissions, city foresters, community leaders, park districts, forest preserve districts,municipalities and individual homeowners requests for technical forestry assistance ... 400 manhours.

2. Forest pest control - Assists forest preserve districts, park districts, municipalities and individuals...300 manhours.

3. Fire control - Assists municipal fire departments in forest fire fighting techniques, prevention measures and control of woodland fires ... 50 manhours.

4. Tree planting (open land) - Assists all ownerships around structure sites and recreation areas for screening purposes, noise abatement, wildlife habitat, aesthetics, landscaping and regular rural and urban tree planting requests for public land (40 acres) and private land (10 acres).

5. Management plans and information and education - Conducts an effective program to get forest land under management and strive to increase public and private awareness of forest land values as a part of land use planning and zoning; especially the non-industrial values such as watershed protection, air and noise pollution abatement, screening, erosion control, recreation, temperature and wind velocity reduction, wildlife, etc.

The installation cost of the needed land treatment measures is estimated to average $86,100 annually. This includes the cost of measures such as debris basins, diversions, and vegetative cover which will be installed each year on land being developed as required by ordinances to prevent excessive runoff, erosion, and sedimentation from construction areas. Also included are the costs of installing forestry measures (tree planting and timber stand improvement).

The accelerated technical assistance for the land treatment program is estimated to cost $25,800 annually. These funds will be used to provide technical assistance to accelerate the current programs. Estimated costs for technical assistance are based on current expenditures for comparable work.

Flood Proofing Program

After installation of the structural measures, some 239 existing residences would still be subject to flooding by a with project condition 100-year frequency flood. A list (by tributary) of the number of residences to be flood proofed follows:

Midlothian Creek	11
Butterfield Creek	1
Thorn Creek	8
Deer Creek	198
North Creek	8
Little Calumet River (Main Stem)	13

This list does not include homes subject to flooding caused by sanitary sewer backup. The above homes have been identified and this information provided to each local governmental unit.

The local governmental units will provide technical assistance to individual property owners to assist them with the flood proofing of improvements. Each homeowner with remaining flood damages will be contacted. The remaining flood hazards will be explained and methods of flood proofing will be provided. Typical flood proofing measures which should be installed are flap gates, sump pumps, barricades to seal openings, and small levees.

The estimated average annual cost of providing flood proofing assistance is $7,000.

Stream Channel Operation and Maintenance Program

Existing stream channels in the evaluated areas will be maintained to perform at their present capacity. Agreements will be made with the appropriate entities of government, including drainage districts, to carry out this program for the life of the project (100 years). Evaluations in this plan are based on adequately maintained channels of at least present flow capacities.

Agreements for operating and maintaining the existing channels to perform equal to their capacities will also be executed prior to installation of the proposed structural measures.

The cost of maintaining the stream channels in their present state is estimated to average $38,000 annually.

Flood Plain Management Program

Control of future development in the flood plain and preservation of the floodway will be accomplished with flood plain regulations. Development within the 100-year flood plain, as identified on the flood plain topographic maps which accompany this report, will be regulated by local zoning, subdivision and building code ordinances.

The floodway, as delineated on the flood plain topographic maps, will be preserved for floodwater storage and conveyance. Developments within the floodways will be restricted to types of development which will not adversely affect their ability to convey floodwaters. Examples of the type of development that would be permitted include parking lots, parks, recreation areas, and forest preserves. The construction of any buildings or the placing of any landfill will not be permitted within the delineated floodway.

Flood proofed development will be permitted on the outer flood plain area known as the floodway fringe. On the floodway fringe, land filling (with compensatory storage) and construction may take place. However, all new improvements on this portion of the flood plain must be constructed at an elevation so as to not be damaged by the projected condition 100-year frequency flood, as defined by the flood profiles which accompany this report. To avoid damages from a 100-year flood, it is recommended that all new construction be at least two feet above this flood profile. (See sample flood plain topographic map LC-5 and flood profile inside the back cover of this report.)

This approach permits flood proofed development in the floodway fringe but tightly restricts development in the floodway. These regulations can be accomplished by revising existing flood plain compensatory storage ordinances, zoning ordinances, subdivision ordinances, and building codes. Hearings will be held and ordinances and building codes will be revised by the appropriate entities of local government to accomplish the above before the selected plan will be installed.

By implementing these regulations and additional land use control measures, each unit of local government will satisfy the minimum requirements of the Federal Insurance Administration, Department of Housing and Urban Development for participation in the regular phase of the National Flood Insurance Program. Federally subsidized flood insurance, not previously available from the private insurance industry, can then be made available for all existing buildings and contents. All buildings within the area subject to inundation by the projected condition 100-year flood should be insured.

An acceptable flood plain regulation program as outlined in this report, shall be enforced in the study area prior to the installation of the planned structural measures. This requires that local governmental organizations revise zoning ordinances, subdivision ordinances, and building codes to preserve a floodway. They must also regulate new construction in the remainder of the flood plain in such a way that it will not be subject to overbank flooding from the projected 100-year flood with the project measures installed.

The cost of implementing an acceptable flood plain management program is estimated to total $62,500 annually.

Excavated Floodwater Retarding Structures

An excavated floodwater retarding structure is a reservoir excavated below flood plain elevation with diversion facilities to direct floodwater into the reservoir and pumping facilities to empty the reservoir after a flood. The main components consist of the diversion structure, an inlet structure, an excavated storage reservoir, and a pumping plant.

The diversion structure is usually an earth fill built across the floodway with reinforced concrete conduits through the fill at channel level. It limits the amount of water which can be conveyed in the floodway beyond the diversion structure and diverts any excess flows through the inlet structure into the excavated storage reservoir. Structures 53 and 143 will have this type of inlet structure. Structures 32 and 84 will not have a diversion structure. The excess flows to the inlet structure of these two structures will be regulated by a channel stage gage. The inlet structure for Structure 53 will consist of an entrance area and a straight drop spillway. The inlet structure for Structure 143 will be a structural system consisting of a straight drop spillway, a transition section, and a straight inlet chute. The inlet structure of Structure 84 will consist of three automatic gates that will raise to allow water to pass over a straight drop spillway. The flows from the straight drop spillway will be conveyed to a vertical drop shaft approximately 150 feet deep into an air separation chamber. From there the flow will travel horizontally 2,600 feet in a mined rock tunnel to the Thornton Quarry.

The excavated storage reservoir is a single reservoir (Structures 53, 84, and 143) excavated below the elevation of the flood plain and is used to store floodwater in excess of that conveyed through the diversion structure. The reservoirs will range from approximately 24 feet deep (Structure 53) to over 200 feet deep (Structure 84) with the reservoir of Structure 143 approximately 40 feet deep. The four reservoirs will have total storage capacities ranging from 567 to 9,595 acre feet.

The reservoir side slopes will range from vertical (Structure 84) to 4:1 (Structures 53 and 143). A portion of the reservoir bottom will consist of a permanent pool for the accumulation of sediment over the 100-year design life of the reservoir. These pools will be at least 5 feet deep. The material to be excavated in these structures varies considerably. Structure 53 excavation will consist of clays underlain by fine sands. Structure 84 is located in an active limestone quarry and will be entirely in rock.

Structure 143 is located in an existing sand pit. Soil material will be hauled into the pit to stabilize the side slopes and blanket the bottom. This material will come from an excavation south of the existing pit. The foundations of Structures 53 and 143 are yielding and most measures constructed for Structure 84 will be on or in solid rock.

Structure 143 will have Burnham Avenue constructed on the east side of the reservoir. This road will be constructed by the Cook County Highway Department. The road shall have a 100-foot top width and 3:1 side slopes.

The reservoir of Structure 84 will be constructed at the same time as the adjacent reservoir proposed for the storage of combined sewage and floodwater by the City of Chicago and the Metropolitan Sanitary District of Greater Chicago. The rock excavated from this reservoir will be stockpiled or sold during construction with the stockpiled material being eventually sold.

Multiple Purpose Structure 32

Structure 32 will consist of an excavated floodwater storage structure with additional excavation being done to add recreation storage. The entire reservoir bottom will contain permanent water.

The inlet structure will be a straight inlet chute with an automatic gate that will rise to allow the excess flows to enter the reservoir. The automatic gate will be controlled by a stream stage gage that will raise or lower the gate to allow the desired diversion flow.

The material to be excavated in the reservoir will be peat to a maximum depth of 20 feet underlain by very soft clays. The side slope of the reservoir will vary from 3:1 to 10:1. The side slopes of the reservoir in peat will be blanketed with a more stable soil material. The structures will be installed on a yielding foundation.

Structure 32 will require 118 acres of land of which 12.7 acres will be permanent water and 40 acres will be suitable for associated recreation use. Recreation use will include boating, canoeing, and fishing. Land areas will be developed for both summer and winter playground activities.

The one multiple purpose structure and the three excavated floodwater retarding structures will have a total combined storage capacity of 12,229 acre feet. (See Table 2, page 105, for structure data.) Total floodwater storage will be 11,848 acre feet. Recreation storage will be 59 acre feet, and sediment capacity will total 609 acre feet, based on a 100-year accumulation. The diversion and

inlet structures and the excavated storage reservoirs will have the capacity to control the 100-year frequency flood. Flood flows in excess of a 100-year frequency will bypass the diversion structure. The mounds and reservoirs are planned in such a manner that the natural flood plain capacity will not be significantly reduced. The four structures will control floodwater runoff from 113.01 square miles, 53 percent of the total watershed area.

The four structures will require a total of about 322 acres of land for their installation. Some 140 acres will be used by the reservoirs, and 182 acres will be used for the diversion and inlet features, channel, spoil areas, and recreation areas.

The pumping plants will consist of multiple electric or hydraulic turbine pumps. Small pumps will maintain a constant permanent pool elevation. Larger pumps are sized to evacuate the excavated storage reservoir. The pumps have a minimum capacity to provide 100 percent draw down in 10 days. The pumping plants will be suitably housed for protection of their equipment and for maintenance. The pumping plants will be operated automatically by reservoir stage gages with automatic shut down override controls from downstream channel gaging points.

Excavated material removed from the reservoir area of structures will be mounded adjacent to the excavation and will be landscaped and shaped to blend into the surrounding topography. The reservoirs and mound areas will be vegetated and maintained for visual quality and to minimize erosion.

Channel Work

The channel work consists of 2.51 miles of earth channels, 0.36 miles of lined concrete channels (all in existing man-made or modified channels), and 0.93 miles of closed concrete conduit.

The earth and concrete channels will be constructed in the same alignment as the existing channels. The conduits for the most part will be located under existing streets.

The Calumet-Union Drainage Ditch Channel and the Midlothian Creek Channel are perennial streams, and the Natalie Creek Channel is an intermittent stream. The channel work will require some clearing of mature woody vegetation in the upper reaches of the Calumet-Union Channel, and some clearing of small woody vegetation on Midlothian Creek Channel and Natalie Creek Channel. There are long reaches, for example Station 120+76 to 167+20 of the Calumet-Union Channel, where there is no existing woody vegetation. The channel work will widen the existing channels but will not substantially increase their depths. Channels will be constructed generally in dense silty clay and sandy silt materials.

The channel improvement reach on Midlothian Creek from Station 28+10 to Station 40+00 has a relatively steep hydraulic gradient. Flow velocities are erosively high. Riprap will be necessary to stabilize the side slopes and the bottom of the channel. Gravel will be necessary to stabilize the bottom of Natalie Creek from Station 7+00 to Station 36+00.

The constructed channels are designed to carry the projected condition 100-year flood flow within banks. The Calumet-Union Channel and the Midlothian Creek Channel will have a substantial amount of drainage area above them controlled by floodwater retarding structures.

The spoil excavated during the construction of these channels for the most part will be removed from the construction area and hauled to Structure Site 53. The channel banks and berms will be seeded to grass immediately after construction to minimize erosion.

Construction for all structural measures will be carried out in a way to minimize water and air pollution. Construction methods will include special features to assure that state and federal EPA standards are met and to assure compliance with local sediment and erosion control ordinances.

Some of the special features that will be required are temporary debris basins; vegetation of the spoil piles as they are constructed; watering of haul roads; disposal of debris by burying or chipping; and protection against pollutants such as chemicals, fuels, sewage, etc. from entering the stream channels.

Provisions of Public Law 86-523 relating to the preservation of historical and archaeological data will be followed. Investigations indicate that installation of the project will not disturb any archaeological value or historical place. However, should any evidence of historical or archaeological materials be uncovered during construction, the Illinois Historical Preservation Officer and the National Park Service will be notified.

Construction Sequence

Construction sequence is optional except as follows: Structure 53 must be constructed before the Calumet-Union Drainage Ditch channel work. Structure 32 and the Midlothian Creek channel work must be completed before the Natalie Creek channel. Structure 32 should be constructed before the Midlothian Creek channel modifications.

Cost of Structural Measures

The total installation cost of the Selected Plan structural measures is estimated to be $30,647,800. The installation costs are divided into the following sub-units: construction, engineering, land rights, and project administration. These costs are tabulated for each plan measure in Table 1, page 103.

Construction costs are the engineer's estimate of the cost of all material, labor, and equipment involved in construction. Unit costs are based on current unit prices for similar construction work recently completed in the Chicago area. A contingency allowance of 12 percent has been added to the construction cost to defray unforeseen costs that might be incurred during construction. Additional costs have been included to stabilize reservoir slopes and bottoms in which sand or peat are exposed in the excavation. Construction costs include such items as clearing, excavation, earth fill, concrete pipe, seeding, fencing, and pumping plants. Construction costs do not include such items as utility modifications, bridge construction, and pavement replacement.

Engineering costs are those costs incurred by engineers, geologists, and other technicians for survey, design, geologic investigations, and preparation and interpretation of plans and specifications. Engineering costs do not include the design cost incurred for utility, road, or bridge modifications.

Land rights costs include the cost of acquiring all land needed for the structural measures. These costs also include survey fees and legal fees incurred in obtaining the needed land. Land rights costs also include the construction and engineering costs associated with road, bridge, and utility modifications.

Project administration costs are those costs associated with the installation of the structural measures. Included in this cost is the cost of contract administration and necessary construction inspection.

Implementation

The sponsor(s) of this plan will prepare an "Implementation Program" providing for implementation of the selected plan. This document will set forth the names and responsibilities of each sponsor and involved agency in (1) enacting the non-structural programs, (2) obtaining land rights, (3) sponsoring project installation, and (4) sustaining an operation and maintenance program. This document will detail distribution of local responsibilities required for implementing the total plan.

Local sponsoring organizations will (1) fully implement the non-structural programs, (2) provide necessary easements and land rights for project installation, (3) administer construction contracts, and (4) assume responsibility for operating and maintaining structural measures and non-structural measures.

They may seek funds to defray all project construction costs, provide for all project engineering costs in the design, preparation of specifications, inspection of construction, execution of certificates of completion, and related tasks for the installation of the project measures.

Operation and maintenance provisions for the excavated floodwater retarding structures, the multiple purpose structure, and the channel work will be required to assure proper functioning of these structural measures. The operation of excavated floodwater retarding structures will include the power requirements to pump stored floodwater and groundwater seepage out of the reservoir. Operational control will be automatic from downstream flow gages and/or reservoir gages. Maintenance consists of monthly inspection visits, motor and pump repairs, building repairs, trash removal, mowing of reservoir and spoil areas, and diversion and inlet structure repairs. The maintenance of the channel work will consist of reseeding, mowing of banks and berms, debris removal, clean-out of sediment and woody vegetation, and repairs to riprap, concrete channel linings, conduits and inlet structures. Maintenance may also require replacement of gages, motors, pumps, and/or other such features.

ENVIRONMENTAL SETTING

Physical Resources

The Little Calumet River Study Area covers an area of 213.3 square miles (136,500 acres) in Will and Cook Counties, Illinois. The center of the study area is at the intersection of U.S. Route 30 and the Calumet Expressway. The watershed is bounded on the north by Blue Island , on the south by Monee, on the west by Tinley Park, and on the east by the Indiana state line. Municipalities located partly or wholly within the watershed include: South Holland, Harvey, Posen, Dixmoor, Robbins, Midlothian, Oak Forest, Tinley Park, Country Club Hills, Markham, Thornton, Lansing, Calumet City, Sauk Village, East Chicago Heights, Chicago Heights, South Chicago Heights, Park Forest, Hazel Crest, Homewood, Flossmoor, Matteson, Park Forest South, and Crete.

The downstream limit of the Study Area is the Little Calumet confluence with the Calumet-Sag Channel. Flow continues westward in the Calumet-Sag Channel to the Chicago Sanitary and Ship Canal. Flow then goes from the Chicago Sanitary and Ship Canal to the Des Plaines River, from the Des Plaines River to the Illinois River, and from the Illinois River to the Mississippi River. The watershed is part of the Upper Mississippi River Basin and lies within designated Water Resources Council Sub-Region 0712. (*17*)

Topographic features of this watershed were influenced by Pleistocene glaciation. These features include low morainic ridges, which dominate the southwestern half of the watershed, and the flat lakebed of glacial Lake Chicago with associated beach ridges which dominates the northeastern half of the watershed. (*19*) Glaciation and subsequent receding of Lake Chicago have left a youthful, poorly developed drainage pattern characterized by numerous poorly drained depressions in the morainal area and broad, poorly drained swales in the lakebed.

The flood plains are irregular in shape and variable in size. They are generally broad and flat in the glacial lakebeds and narrow where valleys are entrenched through moraines and beach ridges. Valley profiles are very irregular with relatively steep slopes through beach ridges and moraines and very flat slopes in the lakebed.

All of the major tributaries to the Little Calumet River rise in the southwestern part of the watershed, cut through the moraines, and flow across the lakebed area into the Little Calumet River. The Little Calumet River flows from east to west along the northern edge of the watershed. The highest land elevation in the watershed is 805 feet above mean sea level on the watershed divide near Monee. The minimum elevation is 558 feet at the Little Calumet's confluence with the Calumet-Sag Channel. Total relief is therefore 247 feet.

The watershed is underlain by Suluriun age dolomite. Glacial and lakebed deposits ranging in thickness from a few feet to over 100 feet cover the bedrock. The dominant glacial deposit is till consisting of a dense, poorly sorted mixture of clay, silt, sand and rock fragments. Lenses of sand and gravel deposited by glacial meltwater occur within the till. The lakebed deposits vary in texture from clay and silt deposited in quiet water to sand and gravel deposited in beaches. Bedrock lies nearest the surface in the northern and central part of the watershed with several outcrops in streambeds and along Thorn Creek near its mouth.

Mineral deposits in the watershed include sand, gravel, clay, peat and dolomite. The number of mining operations has declined during recent years. Cook County mineral production (1971) was valued at $52,492,707. (2) The principal mineral production occurs in the Thornton area where dolomite is quarried.

Surface soils are sand, silt, silt loam, silty clay loam, silty clay or clay in texture. They reflect the texture of the glacial and lakebed deposits. The predominant soils are silt loam. A few areas have silty and sandy soils developed from wind and/or water deposited material on top of till. Approximately 80 percent of the undeveloped area has soils with limitations or constraints for urban developments.

A soil association map, general soils descriptions, interpretations, and limitations are provided as a guide for evaluation of the soils. Detailed investigations are recommended for specific information at particular locations.

The soils descriptions and interpretations are for soils in their natural state and not for disturbed areas. Soil interpretations are based on evaluations to a depth of 5 feet. Soils rated as "slight" have few limitations for their use. Soils rated as "moderate" have limitations that need to be recognized but can be overcome by correct planning and careful design. The "severe" rating means that limitations are so great that they are difficult to overcome and require special planning and design. (See Little Calumet Floodwater Management Plan, pages 7 and 9 for maps.)

Average annual precipitation is 33 inches based on Illinois State Water Survey data. March through October precipitation averages 3 inches per month. November through February precipitation averages 2 inches per month. Precipitation which causes significant flooding occurs on the average of one time every two years. Average annual runoff is 9 inches. Average annual snowfall is 30 inches. (*6*)

January temperatures range from a normal maximum of 35°F to a normal minimum of 19°F. During an average winter, the temperature will fall below 0°F on 12 days. July temperatures range from a normal maximum of 87°F to a normal minimum of 64°F. During an average summer, temperature will rise above 90°F during 30 days. (*6*)

Lake Michigan has a major impact on water resource needs in the Little Calumet River Watershed. At the present time, 36 million gallons of water per day are withdrawn from Lake Michigan for municipal and industrial water supplies within the watershed. (*11*) The Lake supplies over 60 percent of water supply use. The remaining water supply is provided by ground water. Most villages in the southern and western parts of the watershed utilize ground water for their supplies. This water is being withdrawn from deep sandstone aquifers at a rate that exceeds natural recharge (mining). Although concern about mining has been expressed by some villages, the Illinois State Water Survey projects that mining can supply water needs until about the year 2000. Mining is accelerating the intrusion of deeper, saline groundwater. Total dissolved solids is excessive now and will worsen. (*12*)

The following estimates of current (1970) and future (2000) land use are based on data supplied by the Northeastern Illinois Planning Commission and consultation with the Department of Agriculture's Economic Research Service and Forest Service: (*4*)

LAND USE	ACRES	
Developed	1970	2000
Residential	25,200	34,600
Manufacturing	2,300	3,900
Commerce	5,800	6,500
Public Buildings	3,700	4,500
Public Open Space	13,600 1/	27,700
Transportation, Communication and Utilities	4,800	4,800
Streets	10,300	14,800
SUBTOTAL	65,700	96,800
Undeveloped		
Idle	6,500	1,800
Agricultural	58,300	36,700
Forest Land (Private)	6,000	1,200
SUBTOTAL	70,800	39,700
TOTAL	136,500	136,500

1/ 13,200 acres are forested.

Undeveloped land constitutes some 70,800 acres. Some 58,300 acres of this land is agricultural. About 6,500 acres of land has shifted from agricultural production to idle land because of imminent development and/or farming operations becoming uneconomical units. Most of this land is owned by developers. Private forest land constitutes 6,000 acres.

About 30,000 acres are being intensively cropped. A corn and soybean rotation is being followed on about one-half of the cropland. Commercial vegetables are being grown on the remainder. Cook County is the leading onion set producing county in the nation. Most onion sets produced in Cook County are grown in this watershed.

About 10,800 acres would be inundated by the occurrence of a projected condition 100-year frequency flood. An estimated 7,300 acres of this flood plain are now developed (committed to a specific use) with public open space occupying 1,900 acres of the developed area. Undeveloped flood plain totals 3,500 acres.

Urbanization is proceeding in a generally southerly direction in the watershed, with the bulk of the population in the Cook County portion of the watershed. Problems of drainage and surface water management are the major obstacles to development of the relatively flat, poorly drained lands.

Much of this area was originally swampland or prairie interspersed with swamp and marshes. Agricultural development required drainage modifications beginning about 100 years ago. Of particular note, the truck farming operations of the "South Holland Dutch" near South Holland, was the locale of Edna Ferber's novel So Big.

Urbanization southward along the Illinois Central Railroad began to accelerate after 1900 with improved commuter service. At World's Fair of 1893 on the downtown lakeshore area, began plans to move many of the industries and grain elevators located on the downtown lake front to the southern lakeshore area. This was followed by development of the South Chicago, Gary, and Hammond steel and industrial complex.

Further urbanization of agricultural land has required more extensive drainage modifications with the subsequent gradual destruction of most remaining natural vegetation, swamps, and wetland areas. A total of 26 separate wetland areas, having a combined area of 405 acres, have been identified. These wetlands were classified according to Wetlands of the United States, Department of Interior, Fish and Wildlife Service, Circular 39 as follows: (*13*)

1. SE 1/4 of SW 1/4, Sec. 16, T36N, R13E. A type 3 inland shallow fresh marsh of about 10 acres (in process of being filled)).

2. NW 1/4 of SE 1/4, Sec. 20, T36N, R13E. A type 2 inland fresh meadow of about 4 acres in Yankee Woods Forest Preserve.

3. NE 1/4 of SE 1/4, Sec. 29, T36N, R13E. A type 3 inland shallow fresh marsh of about 5 acres in Tinley Park.

4. Sec. 28, T36N, R13E. A type 6 shrub swamp of about 10 acres.

5. SE 1/4 of SE 1/4, Sec. 8, T36N, R13E. A type 4 wetland of about 5 acres. Surrounded by about 10 acres of type 3 inland shallow fresh marsh.

6. SE 1/4 of SW 1/4, Sec. 9, T36N, R13E. A type 4 inland deep fresh marsh surrounded by a type 3 wetland. Total area equals about 40 acres.

7. Center of Sec. 9, T35N, R13E. A type 3 inland shallow fresh marsh of about 15 acres.

8. SE 1/4 of SW 1/4, Sec. 21, T35N, R13E. A type 5 wetland of about 5 acres.

9. SE 1/4 of SE 1/4, Sec. 28, T35N, R13E. A type 5 wetland of about 3 acres.

10. SW 1/4 of NW 1/4, Sec. 14, T35N, R13E. A type 3 inland shallow fresh marsh of about 4 acres.

11. SW 1/4 of SE 1/4, Sec. 11, T35N, R13E. A type 3 inland shallow fresh marsh of about 5 acres.

12. NW 1/4 of Sec. 10, T34N, R14E. A type 3 inland shallow fresh marsh of about 15 acres at upper end of Deer Lake.

13. SW 1/4 of Sec. 2, T34N, R14E. A type 3 inland shallow fresh marsh of about 10 acres bordered by a housing development.

14. SE 1/4 of NW 1/4, Sec. 29, T35N, R15E. A type 3 inland shallow fresh marsh of about 6 acres.

15. SE 1/4 of SW 1/4, Sec. 25, T36N, R14E. A type 5 wetland of about 3 acres.

16. NW 1/4 of NE 1/4, Sec. 30, T35N, R9W. A type 6 shrub swamp of about 6 acres.

17. SW 1/4 of SW 1/4, Sec. 20, T35N, R9W. A type 5 wetland of about 3 acres.

18. SW 1/4 of SE 1/4, Sec. 20, T35N, R9W. A type 3 inland shallow fresh marsh of about 5 acres.

19. SW 1/4 of NE 1/4, Sec. 19, T35N, R9W. A type 5 wetland of about 3 acres.

20. SW 1/4 of SE 1/4, Sec. 18, T35N, R9W. A type 3 inland shallow fresh marsh of about 3 acres.

21. SE 1/4 of SE 1/4, Sec. 13, T35N, R10W. A type 3 inland shallow fresh marsh of about 5 acres.

22. Sections 17 and 16 in vicinity of U.S. Highways 41 and 30. About 40 acres of types 3, 4, and 5 wetlands interspersed through a subdivision.

23. SW 1/4, Sec. 3, T35N, R9W. Types 3 and 4 wetlands totaling about 20 acres.

24. NE 1/4, Sec. 4, T35N, R9W. A type 4 inland deep marsh of about 15 acres.

25. Center of Sec. 34, T35N, R9W. A type 5 wetland of about 5 acres with a type 6 shrub swamp margin.

26. Sections 25, 30, and 29, T36N, R8 and 9W. Cady Marsh is predominantly a type 4 wetland of about 150 acres lying along the north side of Cady Marsh Ditch.

The dominant forest types are oak-hickory (upland sites) and elm-ash-cottonwood (flood plains). Species include the oaks, hickories, elm, river birch, ash, cottonwood, willow, and soft maple. Approximately one percent of the forest land is in the flood plain. None of the forest land is considered commercial because of its rapid development for urban, public, and industrial uses.

Most stands are mature or sawtimber size. Many mature stands occur within the forest preserve districts of Cook and Will County. The hydrologic condition of the present forest stands is good. Ground cover is good to excellent.

A total of 46 lakes and ponds equal to or greater than 5 surface acres presently exist. Wampum Lake and Sauk Lake are most notable. Wampum Lake is located one mile east of Thornton in Zander's Woods Forest Preserve. It was dug to provide fill for Calumet Expressway and has a surface area of 35 acres and a maximum depth of 13 feet. Sauk Lake was created by damming Thorn Creek and is located in Sauk Trail Woods Forest Preserve. It has a surface area of 17 acres and a maximum depth of 8 to 9 feet.

The stream system consists of the main stem Little Calumet River flowing westerly along the northern boundary of the watershed and four major tributaries: Midlothian Creek, Calumet-Union Drainage Ditch, Thorn Creek, and Plum Creek.

The main stem is characterized by very flat gradients. Although this stream channel has been enlarged in past years, it is unable to carry the peak flows from its four major tributary streams. The Indiana portion of the Little Calumet River Watershed has been diverted eastward to Lake Michigan via Burns Ditch. Under extreme peak flood flow conditions, the Little Calumet in Illinois discharges flows via Burns Ditch to Lake Michigan.

Midlothian Creek is an intermittent stream from its source to the newly installed Twin Lakes Reservoir at 163rd Street. From Twin Lakes Reservoir downstream to its confluence with Little Calumet River, it is perennial. Channel modification and filling of natural flood plains is extensive throughout this tributary. The primary exceptions are forest preserve holdings southwest of Oak Forest and peat bogs within the Village of Tinley Park.

The Calumet-Union Drainage Ditch is an intermittent stream at its source. It is perennial at its confluence with the Little Calumet River. This tributary has three major sub-tributaries and a complex internal drainage system which has been strongly influenced by the installation of highways, major storm sewers, and artificial channels. Although some natural streambanks and flood plain areas exist in Homewood and Markham, virtually all channels and flood plains on this tributary have been modified. Urban development of this tributary is essentially complete.

Thorn Creek is the largest single sub-watershed to the Little Calumet River. Thorn Creek has three major tributaries (Butterfield Creek, Deer Creek, and North Creek) and is an intermittent stream from its source in Park Forest South to Sauk Trail Lake. From this point to its confluence with the Little Calumet River, it is a perennial stream. Although the stream channel has been modified upstream from the Village of Park Forest, the flood plain remains essentially in its natural condition. This is due to extensive public land ownership (forest preserves) and development constraints (deeply entrenched flood plain). Thorn Creek from its junction with North Creek to its confluence with Little Calumet River has some potential for recreation navigation except during extreme low flow periods. Approximately 65 percent of the Thorn Creek flood plain is currently in public control.

Butterfield Creek is an intermittent stream from its source in Matteson to Crawford Avenue. From this point, it is perennial to its confluence with Thorn Creek. Like Thorn Creek, channel modifications have been confined to the upstream areas. From Crawford Avenue downstream, both flood plain and channel are essentially in their natural configurations. However, public ownership of the flood plain on this stream is not widespread. Flood plains have not been encroached on due to their deeply entrenched nature and their extensive use as golf courses. Urban development is progressing very rapidly in Matteson and adjacent villages in the upstream areas.

Deer Creek is classified as intermittent from its source in Park Forest South to East Chicago Heights. From this point, it is classified as perennial to its confluence with Thorn Creek. Channel modifications have been made upstream of Deer Creek Lake. From this point to the New York Central Railroad tracks south of East Chicago Heights, the stream and its flood plain are essentially in their natural configuration. Channel modifications and flood plain encroachment have taken place through East Chicago Heights. This modification extends downstream to the point where the stream enters forest preserve district land. Here it continues essentially unmodified to its confluence with Thorn Creek. This tributary has not been significantly influenced by urban encroachment on its flood plain. The upstream watershed area in Park Forest South is being developed for urban use. In other villages along this tributary, urban development has not extended into the flood plain and therefore it remains predominantly in agricultural use.

North Creek (Lansing Ditch) is an intermittent stream from its source south of Sauk Village to U.S. Route 30. From here to its confluence with Thorn Creek, it is a perennial stream. Virtually all its channels have been modified; however, the flood plain from the Lansing city limits to the confluence with Thorn Creek still remains in a natural state. Between U.S. Route 30 and the Lansing city limits, urban development is progressing rapidly. These new developments plus the encroachments in Sauk Village and Lansing leave only those stream areas in forest preserves unmodified.

Plum Creek is an intermittent stream from its source north of Beecher to the Indiana state line. Virtually all of its channels and flood plains are in their natural state.

The Little Calumet River is a perennial stream throughout its entire course. Periodic dredging of the stream channel has resulted in modification of its entire length. Natural flood plain which once existed has been modified by urban development and associated land filling. This stream has an extremely flat streambed gradient. During abnormally high runoff from Thorn Creek, flow occasionally reverses and floodwater flows easterly into Indiana. Flow conditions in Indiana are such that most of the floodwaters that enter Indiana in this manner return through Illinois as increased base flow following these floods.

The Illinois Pollution Control Board adopted water quality standards designating the waters of the Little Calumet River for general use. (*8*) This means that the water is to be protected for aquatic life, agricultural use, primary and secondary contact use, most industrial uses, and insuring the aesthetic quality of the aquatic environment. However, at the present time water in the Little Calumet River does not meet these standards. The water contains unnatural sludge, bottom deposits, floating debris, unnatural color and turbidity, and at times emits offensive odors.

Debris and solid wastes discarded in and adjacent to streams create channel blockages and increase flooding problems. Such disposal of solid wastes in the streams produces unsightly environmental degradation.

Indiana Stream Pollution Control Board Regulation SPC-9 designates water quality criteria to be met by Little Calumet River flow into Illinois. This regulation is similar to the Illinois Standard.

The Environmental Resource Map at the rear of this report shows the location of stream water quality sampling points within the Little Calumet River Watershed. The Water Quality Data Table which follows shows the results of this sampling and analysis and the applicable standards.

WATER QUALITY STANDARDS

Little Calumet River Watershed

Illinois & Indiana

Data Source	Temp. °F	pH	BOD mg/l	Fecal Colif. per 100 ml	Total Phos. mg/l	NH_3 N mg/l	Turbid J.T.U.	Dissolved Oxygen mg/l	Total Suspended Solids mg/l
Illinois General Use Water Quality Standards	Varies	6.5 to 9.0	No Std.	200	0.05	1.5	No Std.	6.0	No Std.
Indiana Regulation SPC-9	90	6.5 to 9.0	10	5,000	No Std.	1.5	0	4.0	No Std.

WATER QUALITY DATA
Little Calumet River Watershed
Illinois Indiana

Samp. 1/ Pt.#	Date (1973)	Temp °F	pH	BOD mg/l	Fecal Colif. per 100 ml	COD mg/l	Total Phos. mg/l	Ortho Phos. mg/l	Total N mg/l	NH_3 N mg/l	NO_3 N mg/l	Tur-bid-ity J.T.U.	D.O. mg/l	Total S.S. mg/l
1	5/8 thru 5/30	56	7.5	7	8,670	43	1.80	1.19	4.55	2.95	2.19	46	4.1	31
2	"	55	8.0	6	4,350	30	.12	<.02	.83	.15	1.37	49	7.5	34
3	"	52.5	7.5	8	34,554	41	1.10	0.62	3.13	1.34	2.12	47	3.4	37
4	"	53	7.6	10	6,714	45	3.08	2.51	7.73	5.27	2.37	46	4.9	72
5	"	52	7.8	5	23,253	27	0.25	<.02	1.19	0.26	2.51	96	8.0	88
6	"	55	7.7	13	2,277	46	2.09	1.72	6.09	3.64	2.77	78	5.9	41
7	"	53	7.7	9	11,288	39	1.89	1.48	7.84	5.51	3.83	108	7.9	63
8	"	54	8.0	7	7,340	35	.15	<.02	.79	.20	1.26	81	6.5	66
9	"	52	7.7	11	44,030	38	1.27	0.99	11.39	9.41	2.80	63	6.9	60
10	"	52	7.6	11	12,740	39	0.96	0.61	13.83	10.98	4.47	77	5.1	63
11	"	52	7.6	7	57,500	26	0.40	0.13	1.87	0.69	2.04	42	7.1	31
12	"	52	7.9	6	6,298	25	0.05	<.02	1.27	0.31	2.17	45	7.5	32

1/ Locations of sampling points are shown on the Environmental Resource Map.

The following descriptions and interpretations are excerpted directly from the Environmental Assessment, Little Calumet River Watershed which was prepared as part of this study.

Little Calumet River. The data collected indicate that in most reaches the Little Calumet River has very poor water quality. The high BOD and high nitrogen, particularly ammonia nitrogen concentrations, together with the low dissolved oxygen and the high fecal coliform counts found in the river are indicators of gross pollution, most of which comes from combined sewer overflows. Nutrients (phosphorous and nitrogen) have high enough concentrations to cause extreme algae blooms when high turbidity does not interfere with photosynthesis.

Thorn Creek. Water quality is poor in Thorn Creek's downstream half, especially below the Bloom Township Sewage Treatment Plant outfalls. The high BOD, COD, phosphorus, and nitrogen (especially ammonia nitrogen) concentrations, together with the relatively low dissolved oxygen seen in the data, are indicators of gross pollution with high nutrient enrichment. Most of these indices, especially phosphorus and nitrogen, are much lower in the upstream sections of the creek above the outfalls. Fecal coliform counts, however, are relatively high at all points along the stream, indicating some sewage contamination upstream as well. The water quality in the upstream reaches of Thorn Creek is fair, with adequate dissolved oxygen to support fish life.

Butterfield Creek. Water quality is poor. The high BOD, phosphorus and nitrogen concentrations are evidence of the heavy pollution load placed on this stream by the discharge of sewage effluent. Fecal coliform counts tend to be comparatively low. The stream is highly enriched with nutrients and the low dissolved oxygen and high ammonia nitrogen concentrations probably limit fish life.

Deer Creek. Water quality is poor. The relatively high BOD and high nitrogen, particularly ammonia nitrogen, concentrations, together with high fecal coliform counts, especially in the downstream sections of the creek, are indicators of the pollution caused by the discharge of sewage effluent. Phosphorus and nitrogen concentrations vary in the samples analyzed, but the creek should still be considered highly enriched. Dissolved oxygen was high in most samples and would be adequate to support fish life.

North Creek. Water quality is relatively good. BOD, phosphorus, and nitrogen concentrations are all low and there is a more than adequate supply of dissolved oxygen. The fecal coliform count is relatively high, however, which may indicate some form of sewage contamination along the creek. The turbidity in the creek is high as well, which may limit some forms of aquatic life.

Hart Ditch. Water quality is fair. The data collected show that the water has moderate concentrations of BOD, phosphorus, and nitrogen, and while the fecal coliform count is high, which may cause a health hazard, so is the dissolved oxygen, which may make the stream suitable for fish life. Extensive algae growth could take place with the proper conditions, but this is unlikely due to the physical characteristics of the stream.

Plum Creek. Water quality is fair. Plum Creek data exhibit many of the same qualities as the Hart Ditch data. There are low to moderate concentrations of BOD, phosphorus, and nitrogen, and a high dissolved oxygen concentration. The fecal coliform count is still moderately high, but not as bad as the counts seen in the Hart Ditch data.

The present condition of the streams demonstrates the results of decades of insults to the natural waterway. The upland watershed areas are generally silted because of poor erosion control, contain excessive bacteria from human and animal wastes, and flow intermittently due to drainage improvements and reduction of the high water table which formerly created springs throughout the basin. Sewage treatment plants proliferate along the streams, resulting in the classification of all of the lower reaches as a "health hazard". The Little Calumet River receives these pollutants and solids

from the tributary streams and, during storms, massive amounts of raw wastes from combined sewer outfalls along its length. The river is muddy and foul smelling and flows along banks lined with sludge and muck. As a result, the river is unsuitable for all but the most pollution-tolerant plant and animal life. Very little recreational use of the river or tributary streams is made over their 120-mile length.

The need for clear water has been established as a national, state, and regional goal and local support for improvement of water quality in the Little Calumet River has been demonstrated. It is projected, therefore, that future water quality throughout the study area will be sufficient to provide improved opportunities for using the streams. Where flow conditions are satisfactory, recreational use of the streams will be possible and streamside properties will be enhanced.

Projections to the year 2000 indicate a substantial increase in urbanization throughout the watershed. The resulting drainage improvements and further lowering of the water table will reduce the natural flow of some streams. Consolidation of sewage treatment into a few regional plants will reduce the flow in some streams which now receive effluent. These factors could result in dry creek beds during the late summer and early fall in several streams within the watershed.

Economic Data

Estimates of past and projected future population and employment for the watershed were aggregated from data supplied by the Northeastern Illinois Planning Commission (NIPC). (*3*) These data are as follows:

Year	Population	Employment		
		Manufacturing	Non-Manufacturing	Total
1965	363,200	32,670	42,390	85,060
1975	481,600	42,710	58,920	101,630
1985	603,000	45,000	88,760	133,760
1995	808,700	47,550	145,850	203,400

The watershed can be characterized as a large, very diverse, rapidly urbanizing area. An estimated 1,000 acres of land are being converted to urban uses each year.

Urbanized areas within the watershed vary greatly as to their relative affluence. This is best exemplified by data compiled by NIPC in 1971 concerning the socio-economic ranking of suburbs within the Chicago Metropolitan Area. A total of 200 suburbs within the metropolitan area have been assigned a composite numerical ranking based on median family income, percent of families with incomes exceeding $25,000, and the educational level of adults over 25 years of age with reference to the percentage of college graduates and median years of schooling.

Median family income for the metropolitan suburban area was $13,380 with 9.9 percent of families having an income in excess of $25,000. Median years of schooling for adults over 25 years old was 12.4 with 15.2 percent college graduates.

The composite rankings for suburbs within the watershed indicate the Villages of Olympia Fields and Flossmoor rank fourth and seventh, respectively, among all the metropolitan suburbs. At the other end of the spectrum; Phoenix, Robbins and East Chicago Heights rank 198th, 199th and 200th, respectively.

The rankings for the 34 suburbs located wholly or partially in the watershed area indicate 22 have median incomes less than the suburban median. Likewise, 28 of the watershed suburbs have a lesser percentage of families with incomes of $25,000 or more.

Nineteen of the 34 watershed suburbs have less median years of schooling than the suburban average. Likewise, 25 of the suburbs have a smaller percentage of college graduates. The preceding findings would indicate an overall socio-economic profile of slightly less affluence than that for the total metropolitan suburban area.

A large portion of the watershed working force now commutes out of the area either to downtown Chicago or to the steel and industrial complex in East Chicago, Gary, and Hammond, Indiana. Several local industries such as the Ford Motor Company stamping plant in Chicago Heights and the Illinois Central Railroad facilities in the Harvey-Markham area are also large employers.

Continued population growth has been and will continue to be accompanied by a build-up of light manufacturing and service industries. This will help in some part to relieve a relatively high rate of unemployment in villages such as Robbins and East Chicago Heights. Overall unemployment rates in the watershed do not appreciably exceed the overall rate of about 2.1 percent for the metropolitan suburban area as of mid-1974.

Local zoning ordinances and building codes vary greatly. Emphasis on single family residences has resulted in high value homes on relatively large lots in Flossmoor, Olympia Fields, and other prestigious residential areas. Home values in these areas are currently in the $70,000 to $100,000 range.

Park Forest, one of the few planned villages in the metropolitan area, is a model of mixed housing, i.e., single family dwellings, townhouses, and apartments. Current market values for homes range from about $40,000 to $70,000. Park Forest South is now being developed in a similar manner.

Home values (not including value of land) are currently in the $25,000 to $40,000 range in the Oak Forest, South Holland, and Lansing areas. Home values in the Harvey-Markham-Hazel Crest area are estimated to vary from $17,500 to $25,000. In the Robbins and East Chicago Heights areas, current home market values are estimated to vary from about $7,500 to $17,500.

Current values for undeveloped land in the watershed are generally lower than for corresponding property in the western and northern metropolitan suburban areas. Land values for single family residential developments range from $3,000 to $10,000 per acre. Land values for apartment, business, and industrial development range from $15,000 to $75,000 per acre.

The crescent shaped agricultural area, which extends along the southern perimeter of the watershed, is used for row crop (corn and soybeans) production and some truck crop farming. Land values for agricultural use are affected by speculation for potential development; however, most land marketed for farming purposes is now in the $1,000 to $1,500 per acre range.

Agricultural land use is projected to decline 37 percent by the year 2000. The remaining acreage, (36,700 acres) will insure continuance of viable cash grain type operations on the remaining farmland.

Plant and Animal Resources

Flood Plain Areas:

The main stem of the Little Calumet River flows through a heavily urbanized area and has little wildlife except for a short reach where it is bordered by Kickapoo Meadows and Calumet Woods Forest Preserves.

Midlothian Creek begins west of the Village of Tinley Park. From its source downstream to Tinley Park, it flows through cropland and housing developments. Streamside cover is chiefly herbaceous vegetation with scattered trees (mostly box elder and willow). This cover provides good habitat for songbirds and pheasants. The part of the creek running through Tinley Park is tree-lined. Between Central Avenue and Cicero Avenue, the stream passes through Yankee Woods Forest Preserve which provides songbird habitat. From this point to its mouth, Midlothian Creek flows through a highly urbanized area comprising the Villages of Oak Forest, Midlothian, Robbins and Dixmoor where it enters the Little Calumet River. This reach provides only limited wildlife habitat except where it borders Midlothian Meadows Forest Preserve, between Cicero Avenue and Crawford Avenue.

Butterfield Creek flows through Olympia Fields, Flossmoor, Chicago Heights, and Glenwood where it enters Thorn Creek. In Olympia Fields, it is about 10 feet wide with good streamside

From Western Avenue in Flossmoor to Chicago Road, it flows through Flossmoor and Idlewild Country Clubs and a residential area. This reach has good streamside tree cover providing habitat for songbirds. At the State Highway 1 crossing, there is a wooded flood plain and an area of cropland.

Thorn Creek, from Thorn Creek Woods south of Park Forest in Will County to the Cook County line, has a continuous band of forest. This habitat is suitable for deer, furbearers, squirrels, songbirds, and other wildlife. From this point downstream to the interchange between Calumet and Kingery Expressways, the creek flows through the Thorn Creek division of the Cook County Forest Preserve. This area has a variety of wooded and open habitats. Outstanding or unusual vegetation includes bur oak and white oak of large size, Ohio buckeye, sassafras, black gum, native orchids, lupines and ferns.

Deer Creek has been dammed about one mile south of the Will-Cook County line to form Deer Lake. Upstream of the lake the creek flows through a marshy area bordered by abandoned land which has been invaded by shrubs and trees, notably sumac, hawthorn, and crabapple. This is excellent habitat suitable for a variety of wildlife. At the 14th Street crossing at the east edge of East Chicago Heights, there is tree cover on both banks of the stream. One mile farther north at Joe Orr Road, the stream is tree-lined and is bordered by cropland. Deer Creek joins Thorn Creek at the south edge of Glenwood in the Glenwood Woods Forest Preserve. There is good woody habitat here.

Plum Creek flows through an 80-acre tract of Will County Forest Preserve land east of Goodenow at the junction of Highways 1 and 324. Most of the creek to the Indiana state line is wooded and much of it is bordered by steep bluffs. The wooded areas are predominantly mature oak forest and are good to excellent habitat but they are being encroached upon by housing development.

Stream Habitat and Fisheries:

A considerable amount of information is available about stream fish habitat in the Cook County portion of the watershed, but none is available for Will County streams. The following data are excerpted from 1967-1973 reports submitted by Harry Wight, Fishery Biologist, Illinois Department of Conservation. In the case of

Calumet-Union Channel, Butterfield Creek, Third Creek, Deer Creek, and Little Calumet River, Mr. Wight's reports are quoted directly.

Calumet-Union Drainage Canal - "This man-made ditch has a large industrial watershed with one small tributary draining a large railroad yard. Large storm sewers, oil films, and black muck were conspicuous during the September 1970 inspection. The stream is primarily made up of long flats with slow flow and averages 1 foot in depth. Bottom type is primarily muck with silty gravel where scoured. Emergent vegetation, the only type observed, was scarce. Most of the banks are well mowed with little stream cover present. Although its maximum width is 15 feet, it averages 8 feet. The 1970 fish collection included green sunfish, fathead minnows, sunfish, and a few largemouth bass. This collection was made after a recent heavy rain which would explain the presence of the bass from upstream impoundments. The stream receives no present recreational usage."

Butterfield Creek - "This stream has a watershed composed of urban and agricultural drainage. The lower watershed has many homes, while the upper was still in row crops as of November 1969. The banks of this stream are heavily wooded. The water color is murky gray with septic odors in mucky areas. The lower part of the creek is silt laden while the remainder meanders with a gravel-rubble bottom and pool-riffle effect. The stream averages 15 feet in width and 1.5 feet in depth. Fish collection includes: fathead minnow, creek chub, golden shiner, black bullhead, green sunfish, Johnny darters, and largemouth bass."

Third Creek - "This very small tributary to Thorn Creek has never been sampled, but gross observation indicates an industrial watershed, rubble bottom, and the presence of oil slicks."

Deer Creek - "Much of this naturally meandering stream runs through heavily wooded forest preserve property. Pool and riffle development is conspicous. Bottom type is gravel silt with under-cut banks common. Water color is brownish green which would indicate silt and fertilization in the watershed. Average width is 8 feet and average depth is 1.5 feet. A 1969 fish collection included: creek chubs, green sunfish, fathead minnows, and goldfish."

Midlothian Creek - "The stream bottom is predominantly silt with some gravel in riffles. Silt load is heavy and pollution is evident. There is no fishing because of the lack of game species of fish. The stream receives storm water drainage and sewage pollution. Fish collected at the 167th Street bridge on September 3, 1970 were black bullheads, green sunfish, white suckers, and creek chubs."

Thorn Creek -"This stream flows through a highly urbanized area. About 80 percent of its length in Cook County is in Cook County Forest Preserve ownership. Although it has a rocky bottom and riffle-pool configuration typical of a smallmouth bass-rock bass stream, poor water quality and urban expansion limit recreation potential and prevent establishment of game fish populations. Some fishing is done by children for bullheads and goldfish. The only fish taken in collections on June 30, 1967 were goldfish and creek chubs."

North Creek -"This small stream is a tributary entering Thorn Creek in Sweet Woods Forest Preserve. Much of the watershed is in forest preserve ownership and no pollution has been reported. However, pollution in Thorn Creek prevents upstream migration of desirable fish species. Fish collected on July 12, 1967 were carp, creek chubs, green sunfish, golden shiners, silver jaw shiners, and some unidentified minnow species."

Little Calumet River - "Within the past five years, the Little Calumet River has been sampled by Fisheries personnel three times in 1967, 1969, and 1971. During the last two samplings, the same three stations were sampled to try to assess any change in the aquatic life between these periods. No observable improvement in the aquatic life could be noticed."

"The Little Calumet River still has an aquatic habitat unsuitable to sustain a desirable fish population. What few fish do survive are low oxygen tolerant species or species that have somehow managed to acclimate to polluted stream conditions. Surprisedly collections have come up with quite a number of species: carp, goldfish, green sunfish, pumpkinseed sunfish, yellow perch, orange-spot sunfish, bluegill, bluntnose minnow, golden shiner, mudminnow, white sucker, alewife, creek chubs, black bullhead, largemouth bass; but most of the fish collected were in localized areas near creek mouths or other effluents of water with a higher water quality. Much of the river is without fish life or has only carp and goldfish."

"The plant community consists mainly of emergent smartweed, cattail, bulrush, water willow along banks and submergent sago pondweed and elodea rooted in sludge beds. Filamentous algae abounds in certain 'quiet water' stretches of the streams. Clean water, hard bottom, streams would probably not have this abundance of submerged vegetation."

"The marked presence of bloodworms literally lining the banks in some sections of the stream, certainly indicates the highly organic waste load that this stream carries. No other aquatic insects or crustacea have been observed in the river."

Mr. Wight stated further that most dissolved oxygen readings in the Little Calumet fall between 0.8 ppm and 2.5 ppm which are below tolerance levels of desirable fish species and most normal stream insects.

Lake and Pond Habitat and Fisheries:

A total of 46 lakes and ponds equal to or greater than 5 surface acres are in existence. Two (unnamed) 5-acre lakes are considered to provide good wildlife habitat. Ten lakes (total surface area - 147 acres) are used for fishing. Wampum Lake and Sauk Lake are most notable. Wampum Lake was recently rehabilitated by the Illinois Division of Fisheries and reopened to fishing in the fall of 1973. Sauk Lake contains only bullheads, carp, sunfish, and goldfish and is considered unmanageable for game fish.

Nature Preserves and Natural Areas:

Jurgensen Woods North Nature Preserve is located in Section 2, T35N, R14E and is owned by the Cook County Forest Preserve District. It was dedicated as a part of the Illinois Nature Preserve System on January 5, 1965. It has a wide variety of plant life including such uncommon species for the area as black gum, purple chokeberry, cinnamon fern, and low blueberry. Part of the area is a mesic-to-wet oak forest and part is a thicket of chokeberry, aspen, ash, and buckthorn.

Thornton-Lansing Road Zanders Woods Nature Preserve includes 440 acres and is located in Sections 34 and 35, T36N, R14E. It is owned by the Cook County Forest Preserve District and was dedicated as a nature preserve on January 5, 1965. Vegetation includes mesic oak woods, scrubby black oak woods (on sand), cattail-bulrush marsh, and a wet, sandy, prairie-like community. The preserve has some rare and unusual shrubs and wildflowers including sassafras, sweet-fern, and lupine.

Thorn Creek Woods located in Northeastern Will County, has been recommended by the Illinois Nature Preserves Commission for acquisition as a nature preserve and recreation area. Of the total 952 acres, 351 are considered suitable for use as a nature preserve. The description which follows was taken from "Report on Thorn Creek Woods Will County to the House of Representatives of the 77th General Assembly by the Illinois Nature Preserves Commission," dated April 15, 1971.

The area is bounded on the north by the Village of Park Forest and on the west by the campus of Governors State University. It lies between Western Avenue and Monee Road. Thorn Creek Woods is an oak forest in the upper reaches of Thorn Creek Watershed. The upland forest is dominated by white oak, red oak, and bur oak with scattered blackcherry, swamp white oak, and shagbark hickory. Ravine forests are red oak, basswood, sugar maple, and black maple. Hop hornbeam is common on dry steep slopes. Walnut, swamp white oak, red oak, ash, and elm occur on the flood plain. The shrub layer in upland sites is dominated by viburnums and hawthorns. The herbaceous flora includes hepatica, blue phlox, spring beauties, and other wildflowers.

Markham-Gensburg Prairie is located in Cook County, Section 13, T36N, R13E. This prairie area contains about 120 acres. The Nature Conservancy owns 60 acres and is initiating acquisition of an additional 53 acres. The entire prairie qualified for dedication as a nature preserve.

Wetlands:

A total of 26 wetland areas (405 acres) have been identified. These wetland areas furnish food and cover for deer, pheasants, furbearers, waterfowl, songbirds, shorebirds, and wading birds. The three Type 4 inland deep fresh marshes are the largest (205 acres) wetland areas and have the greatest potential for preservation as open space and wildlife habitat.

Wildlife:

Seventeen species of amphibians, 27 species of reptiles, 97 species of birds, and 41 species of mammals are known or likely to be found in the watershed. (A listing of these species of amphibians, reptiles, birds, and mammals and their preferred habitats has been prepared and filed with the supporting data for this report.)

Waterfowl using migration corridors that pass through the area include 600,000 mallards; 35,000 baldpates; 25,000 pintails; 100,000 black ducks; 280,000 scaup; 117,000 ring-necked ducks; 160,000 Canada geese; and 9,000 snow geese. Pheasants, furbearers, waterfowl, songbirds, shorebirds, and wading birds are the most common wildlife species in existence. (*13*)

Six species of birds considered to be rare or endangered in Illinois are found in the watershed. The watershed is in the range of and contains habitat important to four species of amphibians and reptiles rare in Illinois. These animals are listed as follows in the Inventory of Fish and Wildlife Resources of the Little Calumet River Watershed with their status in Illinois and preferred habitats:

Black-crowned night heron - Nycticorax nycticorax - rare - marshes and woods.

Red-shouldered hawk - Buteo lineatus - endangered - marshes, woods, farms, and orchards.

Marsh hawk -- Circus cyaneus hudsonius - rare - marshes, open fields, meadows, thickets, and hedgerows.

Barn owl - Tyto alba - endangered - open fields, meadows and pastures.

American bittern - Botaurus lontiginosus - rare - ponds, sloughs and marshes (not wooded).

Brewer's blackbird - Euphagus syanocephalus - rare - open fields, meadows and pastures.

Blue-spotted salamander - Ambystoma laterale - rare - swamps (wet, wooded land).

Four-toed salamander - Hemidactylium scutatum - rare - bogs.

Eastern woodfrog - Rana sylvatica - rare - woods.

Western slender glass lizard - Ophisaurus attenuatus - rare - open fields, meadows and pastures.

Recreational Resources

Recreational resources within the watershed consist of approximately 13,200 acres of forest preserve land, 380 acres of local park district, and 10 private golf courses.

All golf courses are private with access limited to members and guests. The forest preserve district land and park district lands have unlimited public access. Much of this land is limited to a few activities such as hiking and picnicking.

Some streams provide recreational resources particularly in the lower reaches. The Little Calumet main and the lower reaches of Thorn, Deer, North, and Butterfield Creeks provide canoeing and boating. Stream fishing is practically nonexistent.

There is public access to some 30 miles of a total 109 miles of stream in the study area. The primary recreation use of the streams is for canoeing and boating.

A few small reservoirs formed by removal of borrow material for highway construction provide limited recreation to private developments. Wampum Lake and Sauk Lake owned by the Cook County Forest Preserve District provide some limited fishing.

Utilization of recreational resources in the watershed is unusually high. Use is influenced by the demand of the population within the watershed and the population adjacent to the watershed within one-half hour travel time. These two categories encompass some 2.1 million people. Present recreation use of the forest preserves within the watershed is approximately 3.9 million visitors per year.

Hunting is of minor importance. There are a few private clubs primarily for skeet and trap shooting.

The southwestern shore of Lake Michigan parallels the northeastern boundary of the watershed. The lake front in this area is primarily an industrial complex. Public access is extremely limited. Lake Michigan provides very little recreation for the residents of the Little Calumet River Watershed.

Archaeological and Historical Values and Unique Scenic Areas

The Little Calumet River Basin is an important archaeological area for data from the later prehistoric period. Several important specific sites are known and there is a strong conviction among authorities that a great many important unexplored sites exist. Because of possible abuses, it is the policy of the Illinois Archaeological Survey that the locations of known sites are not made available to the public. As a part of this study, a detailed survey was made of each potential structure site area.

No places of historical interest in the watershed have been accepted for inclusion in the National Register of Historic Places. Four sites of historical significance are identified in the Environmental Assessment of the Little Calumet River Watershed. These are as follows:

H1 Sec. 15, T36N, R13E. Portions of a Civil War-era powder mill allegedly remain on the forst preserve land in this vicinity.

H2 Sec. 25, T36N, R14E. The South Holland Historical Society occupies the Paarlberg Home Museum near 170th Street and Paxton Street. This former farm house is over 100 years old.

H3 Sec. 31, T35N, R14E. The pioneer homesite of John McCoy, soldier in the Revolutionary War and later a station on the underground railroad for escaped slaves. Maintained by the Cook County Forest Preserve District.

H4 Sec. 20, T35N, R14E. Site of the cabin of Absalom Wells, the first white settler in this part of Cook County. Maintained by the Cook County Forest Preserve District.

Areas of natural beauty identified in the Environmental Assessment of the Little Calumet River Watershed are described as follows:

P1 Markham-Gensburg Prairie (approximately 120 acres). Sec. 13, T36N, R13E. Sixty acres of this fine prairie was donated to the Nature Conservancy. The Nature Conservancy is initiating acquisition of an additional 53 acres. The area includes mesic and sandy prairie with some wet prairie. It is relatively undisturbed and contains a great number of prairie species. The entire area qualifies for dedication as a nature preserve.

P2 Calumet Slough, Sec. 6, T36N, R14E. A small area consisting of relatively undisturbed flood plain woods. A lack of open space in the vicinity makes such a site particularly valuable in its natural state.

P3 Sand Ridge Nature Center. Sec. 13, T36N, R14E. Examples of a variety of natural vegetation and wildlife habitats maintained by the Cook County Forest Preserve.

P4 Sand Ridge Prairie (approximately 60 acres - not in study area). Sec. 18, T36N, R14E. This large prairie is contiguous with Sand Ridge Nature Preserve, east of the Penn Central Railroad. It is of similar quality and would be a valuable addition to the nature preserve.

P5 Jurgensen Woods North Nature Preserve and Thornton-Lansing Road Zanders Woods Nature Preserve. Sec. 2, T35N, R14E and Secs. 34, 35, T35N, R14E. Both of these preserves, which are owned by the Cook County Forest Preserve District, have a wide variety of plant life, including oak forest and uncommon species of trees, shrubs and wildflowers.

P6 Sec. 14, T36N, R14E. This is a stand of hardwood trees along the Little Calumet River.

P7 Sec. 24, T36N, R14E. This is a stand of hardwood trees near the confluence of Thorn Creek and the Little Calumet River.

P8 The Homewood Spit. Sec. 32, T36N, R14E. This is the last undeveloped area in a fossil sand dune. It also contains some native prairie species.

P9 Cherry Creek. Sec. 36, T36N, R13E. This is an area of wooded flood plain near Homewood.

P10 Sec. 23, T35N, R13E. This is a wooded area along Butterfield Creek near Olympia Fields.

P11 Thorn Creek Woods (952 acres). Secs. 1, 2, 11, and 12, T34N, R13E. The Illinois Nature Preserves Commission has recommended the acquisition of this area as a nature preserve and recreation area. Thorn Creek Woods is an oak forest in the upper reaches of Thorn Creek Watershed. The upland forest is dominated by white oak, red oak, and bur oak with scattered black cherry, swamp white oak, and shagbark hickory. Ravine forests are red oak, basswood, sugar maple, and black maple. Hop hornbeam is common on dry steep slopes. Walnut, swamp white oak, red oak, ash, and elm occur on the flood plain. The shrub layer in upland sites is dominated by viburnums and hawthorns. The herbaceous flora includes hepatica, blue phlox, spring beauties, and other wildflowers. A wide variety of birds and mammals inhabit Thorn Creek Woods.

P12 Sec. 3, T34N, R13E. There are stretches of native prairie vegetation along the Illinois Central Railroad tracks between Governors State University and Richton Park.

P13 Deer Creek Woods (23 acres). Sec. 13, T34N, R13E. This is a 3-acre grove of mature oaks and a 15-acre grove of conifer and mature oaks that lie within the village limits of Park Forest South.

P14 Secs. 8 and 17, T34N, R14E. About 160 acres have been used extensively as a field laboratory by students at Governors State University. Native prairie grasses and prairie flowers are located on the site.

P15 Sec. 33, T34N, R14E and vicinity. The upper watershed area of Plum Creek contains sections of woodland which provide increasingly valuable wildlife habitat. This area is one of the last known ranges in the Little Calumet Basin of the Massasauga rattlesnake and Kirtland's water snake.

P16 Sec. 18, T34N, R15E. The area where Klemme Creek crosses Klemme Road is an unusually scenic point. The creek flows through a rolling pasture and a small grove of oak trees.

P17 Sec. 7, T34N, R15E and vicinity. The rolling, wooded hills along Plum Creek in this area are very scenic and provide a valuable wildlife habitat.

P18 Secs. 3 and 4, T35N, R9W. This area is recognized as containing valuable prairie with many species of native vegetation.

P19 Secs. 29 and 32, T36N, R15E. A 15-acre farm stretches along the state line in a heavily urbanized area.

P20 Sec. 10, T34N, R13E. An area on property owned by Governors State University, known as the Sztuba parcel, contains many species of prairie plants.

Unique Geological Areas

Areas of geological interest identified in the Environmental Assessment of the Little Calumet River Watershed are described as follows:

G-1 Area within Secs. 10 and 11, T36N, R13E. An area where the Niagaran series of undifferentiated dolomitic limestone formations is exposed. This is a heavily urbanized area, but the exposed rock may be of interest within small parks.

G-2 NW 1/4 of NW 1/4, Sec. 1, T36N, R13E. An area where the Niagaran series of undifferentiated dolomitic limestone formations is exposed. Although in an urbanized area, there is an area surrounding two water impoundments which could be enhanced for recreation and possibly fossil hunting.

G-3 Sec. 10, T35N, R13E. Several hundred acres of sand and silt from a deltaic deposit in a glacial lake. One of only a few such sites in the Chicago area.

G-4 Sec. 22, 23, T35N, R14E. A large portion of East Chicago Heights is on exposed or thinly covered Niagaran series of undifferentiated dolomitic limestone formations. An area west of Cottage Grove Avenue was quarried for a short time and may be ideal for fossil hunting.

G-5 Sec. 26, T35N, R14E and Sec. 4, T35N, R14E. These are areas along Deer Creek and Thorn Creek where the Niagaran series of undifferentiated dolomitic limestone formations is exposed. The sites may be well suited for recreation and fossil hunting.

G-6 Sec. 35, T36N, R13E and Sec. 2, T35N, R13E. These are two areas which were designated as having a potential for artificial groundwater recharge in conjunction with flood control on the Calumet-Union Drainage Canal.

G-7 Sec. 31, T35N, R14E. The Thorn Creek Valley north of Sauk Trail Lake has been identified as the area in the Chicago Heights-Park Forest vicinity most geologically favorable for artificial groundwater recharge through pits.

Land, Water and Plant Management Status

Urbanization is occuring at a rapid rate in the watershed. Approximately 1,000 acres of forest, agricultural, and idle land are being converted to urban uses each year. Projections indicate that this trend will continue through the year 2000. Forest land is expected to decrease by 25 percent by the year 2000.

Forest preserve districts, park districts, and municipalities are acquiring agricultural, forest, and idle land for public open space and recreation as funds become available. Projections of the Northeastern Illinois Planning Commission indicate an additional 59,300 acres of open space will be needed in Will and Cook Counties by 1976. (*10*)

Activities of the Will and South Cook County Soil and Water Conservation District within this watershed are essentially limited to natural resource reviews on parcels of land where zoning changes have been requested. Probable impacts on water and related land resources are provided to the unit of government responsible for the zoning change. The local District also provides services including soil interpretations, resource conservation planning, and technical assistance, including engineering and design of conservation measures.

Municipal and county governments through their zoning, and subdivision building permit ordinances control methods of construction and development. However, there are few comprehensive sediment and erosion control ordinances which prescribe methods of construction which effectively control erosion and sedimentation.

Forest Preserve Districts have an excellent program of plant management on their lands. Management includes the removal of diseased, damaged, and mature trees. The Cook County Forest Preserve District has reforested 65 acres in the past five years. The Districts cooperate with individuals and other agencies in plant research and management.

Most of the undeveloped land is owned by investors. The land is being held for potential urban development. Operators who farm this land generally operate with one year leases. They do not apply extensive erosion control practices.

Inadequately treated wastewater enters most streams in the study area. Plans for regional wastewater management have been prepared by the Northeastern Illinois Planning Commission, the Chicago District of the Corps of Engineers, and the Metropolitan Sanitary District of Greater Chicago. The Regional Wastewater Plan developed by the Northeastern Illinois Planning Commission is an element of the Comprehensive General Plan for Northeastern Illinois. (*9*) It was adopted by the Commission on March 3, 1971. The objectives of the Corps of Engineers, Chicago South-End of Lake Michigan Regional Wastewater Management Studies were to identify a variety of potential regional wastewater management systems capable of achieving the water quality goals set by the Congress of the United States. (*15*) These goals include no discharge of critical pollutants consistent with the maximum removal capabilities of existing technology. The results identify the economic, environmental, social and national implications of such a policy. MSDGC's Tunnel and Reservoir Plan is a solution to the problem of combined sewer overflows. It appears that it will take 10 to 20 years to implement adequate solutions for wastewater management.

Projects of Other Agencies

The Illinois Department of Transportation, Division of Waterways, recently completed construction of a floodwater retarding structure on Midlothian Creek between 163rd and 167th Streets. This structure will store 920 acre feet of floodwater. The Division of Waterways has also undertaken some channel improvement and bridge modification work downstream of the floodwater retarding structure in Oak Forest. These structural improvements were considered in place and part of the integrated program for flood control on Midlothian Creek.

The Metropolitan Sanitary District of Greater Chicago (MSDGC) is presently constructing an excavated floodwater retarding structure on Calumet Union Drainage Ditch between 175th Street and the Tri-State Tollway. This structure will provide 500 acre feet of floodwater storage on the East Branch. It was considered in place and part of the integrated program for flood control on Calumet Union Drainage Ditch.

The Chicago District of the Corps of Engineers has been authorized to perform a clean-up project on the main stem of the Little Calumet River in Illinois. This will be a two-stage program consisting of a planning stage and then a contract for cleanup and debris removal. The MSDGC will be asked to be the local sponsor for this project action. Since this is an authorized project, it is being considered as a project of another agency which will be performed and be part of an integrated program for water resource development.

The MSDGC has recently completed and adopted a plan for collecting and treating water from combined sewer areas. The implementation of this Tunnel and Reservoir Plan will provide substantial water resource development benefits to the combined sewer area and adjacent separate sewered and unsewered areas. Primary benefits will be a reduction of combined sewer overflows, improved water quality, and floodwater damage reduction. Some alternatives in this plan make use of the Thornton Quarry for surface storage. This introduced the possibility of multiple use of the Thornton Quarry site for storage of combined sewer overflows as part of the Tunnel and Reservoir Plan and storage of excess floodwater from Thorn Creek as part (Structure 84) of this Floodwater Management Plan. The Tunnel and Reservoir Plan is being considered as in place and part of the total integrated program for water resource development.

The Chicago District of the Corps of Engineers has been authorized by the Congress of the United States to perform a study of the Little Calumet River and its tributaries. This authorization was provided by resolutions passed by the Committee on Public Works of the United States House of Representatives on July 29, 1955 and by the Committee on Public Works of the United States Senate on July 26, 1965. Under this authorization, the Corps of Engineers has prepared the Interim Review Report for the Little Calumet River in Indiana dated December 1973. The report recommends construction of a multiple purpose channel improvement plan for flood control, recreational navigation and recreation. The implementation of this plan is supported by the State of Indiana to satisfy its water resource development objectives. This plan is being considered as the recommended plan for the Indiana portion of the watershed and part of the total program for water resource development in the Little Calumet River Watershed.

WATER AND RELATED FLOOD RESOURCE PROBLEMS

Floodwater Damage

Floodwater damages are estimated to average $3,134,000 annually. Inundation of residential property, the principal floodwater damage, varies in magnitude from flooding of streets and lawns to major damage caused by flooding the basements and first floors of buildings.

Damages to 6,950 existing homes and other residential properties are projected to average $2,469,500 annually. Damages to individual homes and contents vary greatly depending on the depth of flooding and type of house construction.

Residential floodwater damage occurs frequently throughout most of the watershed. This is illustrated by the following table which shows the extent and magnitude of residential flooding for the projected condition 2-, 5-, 10-, 25-, and 100-year frequency floods for the Little Calumet main channel flood plain area.

Frequency Interval	Homes Flooded	Estimated Damages
100-year	6,950	$59,048,700
25-year	4,670	15,931,700
10-year	781	4,317,400
5-year	198	740,900
2-year	17	223,400
Average Annual		$ 2,469,500

About 66 percent ($1,641,200) of the projected average annual damage to residential property occurs on the intensively developed flood plain of the main stem of the Little Calumet River. An estimated 4,392 residences are subject to damage in this area.

Flooding on the Calumet-Union Drainage Ditch tributary is projected to cause average annual damages of $467,800 to 1,565 existing homes. Nearly 80 percent of this damage ($361,500) results from inundation of the area north of 159th Street to 151st Street east of Western Avenue.

Other major areas of flooding are on the North Creek and Midlothian Creek tributaries. A total of 679 existing homes will sustain average annual damages of $179,700 in the Midlothian Creek area. A total of 106 existing homes will sustain average annual damages of $166,000 on the North Creek flood plain.

Relatively minor damages occur on the Butterfield Creek, Deer Creek, and Thorn Creek tributaries. Total projected average annual damage to 207 existing homes in these areas is $14,800.

Damages to 142 existing business places are projected to average $43,500 annually. Most business places are located higher than the projected condition 100-year frequency flood profile. Also many business buildings do not have basements; these two factors limit the frequency of damaging flooding.

Traffic disruption is the second most important type of floodwater damage. Damages consist of additional costs incurred because of delays in travel by commuters, travelers, and vehicles providing services in the area. Future damages from disruption of traffic on major highways (7,400 disruptions annually) are estimated to average $98,700 annually.

Associated damages are estimated to average $522,300 annually. Damages consist of both private and public costs incurred because of flooding. An example of private costs include income foregone when workers are unable to reach their place of employment as a result of traffic disruption on arterial streets and roads. Likewise, individual homeowners incur expenses for sump pump operations, motel rentals, and meals in the event their homes are made uninhabitable. Other associated damages include flooding of residential streets, lawns, and gardens.

Associated damages to the public sector include additional costs for traffic direction necessitated by traffic disruption on major streets and roads. Flooding aggravates problems of channel maintenance and makes necessary the removal of debris from waterways following flooding. Disposal of debris is very costly. Costs for debris disposal in the metropolitan area are estimated to range from $0.90 to $1.25 per cubic yard at the present time.

Polluted floodwater causes public health hazards. Intensively developed residential areas that are inundated for prolonged periods by floodwaters polluted from combined sewer overflow, other urban runoff and agricultural pollutants are subject to serious health hazards.

Storage of floodwaters in depressional undeveloped areas increases the problems of mosquito infestation and attendant health hazards. Several mosquito abatement districts in the watershed area monitor and spray these problem areas following flood events.

Frequent residential flooding causes neighborhood degradation, a reduced quality and quantity of usable living space, and reduced structure life. Confidence in the individual neighborhood's future, on the part of both residents and financial institutions, is lessened. This often results in (1) the delay of needed repairs and/or improvements and/or (2) sale of homes at depressed values to "transfer" the flooding problem to an unsuspecting buyer.

Estimates of future average annual damages are based on the assumption that no new development will be constructed subject to a flood hazard. Flood plain regulations are assumed to control future development to avoid significant damage. However, for the most part these regulations are not yet in effect throughout the watershed. A need exists for ordinances to (1) regulate development in the flood plain, (2) prescribe compensatory storage for flood plain filling, and (3) preserve floodways to reduce damage to existing and future developments.

Evaluations of flood damages in this study have been limited to damages caused by overbank stream flooding. Sanitary sewer backup occurs during periods of intensive rainfall and prolonged duration flooding causing damage to many home basements. Sewer backup results from seepage into inadequately sealed sewer systems, and the pumping of downspouts and foundation drains into the sanitary sewer system.

The problem of sanitary sewer backup is a separate problem not always related to overbank flooding. However, alleviation of the problem in some areas cannot be insured without first reducing the overbank flooding problem.

A general lack of coordination between governmental entities in improvement and maintenance of stream channels has tended to amplify flooding problems. An example of this is upstream channel enlargement or storm sewer construction which,although reducing local flooding, increases downstream flooding.

Development of upland areas with uncontrolled storm drainage discharges is one of the most significant factors causing increased runoff and greatly increased flood flows. Flood plain filling and subsequent development have reduced flood plain storage and obstructed conveyance of flood flows. Development, in both the upland and flood plain areas, if uncontrolled, will increase the frequency and depth of flooding thereby increasing flood damages on existing structures.

Land and Water Management

Major problems are: (1) excessive erosion on crop and idle land, (2) excessive erosion on lands undergoing urbanization, and (3) urban development on soils with water management problems.

Average erosion rates for cropland and idle land within the watershed are 8.4 tons per acre per year. The major portion of this erosion is occurring along the southern rim of the study area from Monee to the Illinois/Indiana state line. Common farming practices presently include extensive row cropping and fall plowing. Contour plowing and conservation tillage are seldom used.

Operators who farm the agricultural land generally operate with one-year leases. This limits their economic ability to apply needed land treatment measures. Owners are reluctant to apply land treatment measures because much of the land is being held as potential for urban development and not for long-term agricultural production.

Lands under development are often left without vegetative cover for long periods (up to two years). This results in excessive runoff, and erosion on land being converted to urban uses.

Municipalities are not making full use of resource information when developing master plans and issuing building permits. The use of resource information including soils interpretation is needed to assure proper land use and treatment.

Erosion Damage

Sheet and rill erosion occur intensively around the southern rim of the watershed from Monee to the Illinois/Indiana state line on cropland and idle land. There are approximately 30,000 acres of cropland and idle land in this portion of the watershed. The table below shows erosion rates and approximate acres within each erosion category:

Erosion Rates (T/AC/YR)	0-3	3-8	8-12	12+
Acres	6,100	8,200	13,100	3,000

Excessive erosion occurs at most construction sites resulting in off-site sediment damages. Approximately 1,000 acres of land are being converted to urban uses each year. During any period of time approximately 2,000 acres are exposed to erosion since construction normally requires 2 years. The average gross erosion from construction sites within the watershed is approximately 24 tons per acre per year with ranges from almost no erosion to greater than 100 tons per acre per year.

Estimated rates of erosion from forest land is 0.7 tons per acre per year. Heavily impacted recreation sites have slightly higher rates as soils are compacted and ground cover is reduced. Such areas are very small in relation to the entire forest area.

Sediment Damage

Major sediment problems are related to present and future land utilization and management. Sediment concentration in runoff water adversely affects utilization of the water and adjacent land. Sediment deposition on the flood plain is not a significant problem.

The three major sources of sediment are: (1) erosion from cropland and idle land, (2) erosion from construction sites, and (3) urban storm water runoff. Of the sediment transported by the Little Calumet River at its outlet, it is estimated that 54 percent comes from agricultural, idle, and forest land; forty percent comes from urban storm water runoff; and six percent comes from construction sites.

Sediment from construction sites (about 11 tons/acre annually) obstructs storm drains and deposits on streets. This type of damage occurs primarily within the area of construction and on areas immediately adjacent to construction sites. Costly maintenance is required to correct such problems.

Sediment from agricultural land obstructs storm drains, drainage ditches, and road culverts, and increases the suspended sediment in streams. Much of this damage occurs very near to intensively cropped land.

Average suspended solid concentrations vary from 72 parts per million in the lower reaches of Thorn Creek to 31 parts per million in the Little Calumet main and the upper reaches of Plum Creek. These concentrations severely limit utilization of streams for many recreational and aesthetic purposes.

Sediment accumulation in stream channels is a problem. Sedimentation causes some losses in channel capacities primarily in the upper reaches of streams with extremely flat gradients and along the main stem of the Little Calumet River. Periodic sediment removal is required for some streams and drainage ditches.

The estimated average annual sediment yield at the watershed outlet is currently 242,000 tons per year. Most of this sediment is deposited in the Calumet-Sag Channel and other downstream navigation channels.

Recreation Problems

Present water related recreation demand is estimated at 145,000,000 user-days annually. Year 2000 water related recreation demand is projected to be 203,000,000 user-days annually. Demand is presently 70 percent unsatisfied and is projected to increase to 75 percent unsatisfied at the year 2000. (*14*)

Population in the Chicago Metropolitan Area is approximately 6.9 million with a projected population of 10.2 million by the year 2000. Approximately 30 percent of this population is within one-half hour commuting distance of the watershed.

Within the area of influence of the watershed, resources are not adequate to meet recreation demands. There is a need for additional water related recreational facilities for residents within and immediately adjacent to the watershed. The need exists for all kinds of recreational facilities.

Poor water quality severely limits the recreation potential of the Little Calumet River and its tributaries. Supplemental flow during low flow periods to improve the quality of the water and to increase the quantity is needed to restore and maintain recreational use of many of the streams. Projections indicate that the flow during low flow periods will decrease as more of the upstream areas are urbanized.

Forest preserves and local parks represent significant resources and are available for public uses. Golf courses and other recreational developments are not available to the general public except through membership.

Local park districts own approximately 380 acres of land in the watershed which is used for recreation purposes. The primary interest at this time is to develop land and related water which is already owned by park districts.

Because of inaccessibility, Lake Michigan supplies little water-related recreation to watershed residents. Lake Michigan also does not provide calm or "quiet" water recreation opportunities.

Public access for lake and stream fishing is limited. Only two impoundments are open to public fishing. Stream fishing is practically non-existent due to pollution. Opportunities for hunting still exist (doves, pheasants, quail, squirrels, and rabbits) but are diminishing rapidly. It is unlikely that hunting will continue to be an important form of outdoor recreation.

Public Open Space Problems

The Northeastern Illinois Planning Commission's projections indicate that an additional 1,200 acres of public open space will be acquired by the year 2000. This will supply part of the regional open space needs for the entire metropolitan area. Approximately 13,600 acres of land are presently dedicated to public open space in the study area. (*4*)

Projections indicate that there will be a shortage of approximately 47,700 acres of open space in Cook County and approximately 11,600 acres of open space in Will County by 1976. (*10*) Forest preserve districts, local park districts, and other units of government are obtaining land for open space as funds permit.

Approximately 17 percent of the existing public open space is being used for intensive recreation purposes. The remainder is not intensively used primarily because it has not been developed for intensive recreation purposes. Some of the remainder will be maintained to preserve its natural environment.

Irrigation Problems

The need for agricultural field crop irrigation is negligible in this watershed. Nurseries and golf courses have a limited need for irrigation water. Sources of irrigation water supply are tributaries of the Little Calumet River and wells. There is sufficient quality and quantity from these sources to meet the projected needs.

Municipal and Industrial Water Problems

About 60 percent of the current water usage in the Little Calumet River Study Area is supplied from Lake Michigan via the City of Chicago water supply system. Villages north of 183rd Street and east of Crawford Avenue presently receive over 90 percent of this lake water. As population concentrations move south and west, the demands for additional water will likely be met from Lake Michigan and/or accelerated mining of ground water.

Villages wholly or partly within the watershed use a total of 65 million gallons per day or an average of 130 gallons per capita per day. Although the per capita use is expected to remain relatively constant until the year 2000, the total municipal and industrial water demand will increase to 105 million gallons per day. The largest portion of this demand could be met through increased ground water mining, but ground water quality will worsen and eventual depletion will occur. The Illinois State Water Survey projects that spot shortages will occur by the year 2000. (*12*)

Drainage Problems

Subsurface drainage of the soils in the watershed is generally adequate for agriculture. However, topography and soil conditions produce a high water table during most times of the year causing severe limitations on basement and other underground construction. This means that subsurface drainage systems are necessary for all underground construction. In many areas, stream channels and drainage ditches are not low enough or adequate to provide a gravity outlet for subsurface drainage. Therefore, pumped drainage from foundation drains is necessary.

Further complicating the drainage problem is the undesirable practice of outletting pumped foundation drains into the sanitary sewer system. During periods of heavy rainfall, when surface water is ponded or during periods of overbank flooding from major stream channels, these foundation drainage systems operate at near capacity. An average pump capacity for a foundation drainage system is 30 gallons per minute. The addition of this water into the system severely overloads sanitary sewers causing back up into homes with the lowest gravity inflow. The Metropolitan Sanitary District and local villages and sanitary districts are attempting to restrict the connection of foundation drains into the sanitary sewer systems. Building codes now prohibit these connections in most areas. However, older connections present a major problem.

Acute storm drainage problems exist in Markham, Posen, Midlothian, and Harvey. These areas have extremely flat topography, and until recent years suitable drainage outlets have been inaccessible.

Installation of a major 10-foot diameter conduit during Interstate 57 construction has now provided an excellent storm drainage outlet. However, local drainage facilities have not been constructed and/or modified to take advantage of this facility. Therefore persistent ponding in shallow depressions, road ditches and drainage ditches occurs even after light rainfalls. This standing water provides a breeding environment for mosquitos, kills lawns and other desirable vegetation, and degrades the visual quality of the area.

In addition to the surface effects of this poor storm drainage excess standing water stresses subsurface drainage systems by extending the high water table duration in the spring and fall. Systems affected include foundation drains, sanitary sewers, and septic systems. Some impacts are increased roadway maintenance, increased quantities of groundwater leakage into sanitary sewers increasing the possibility of overload situations, and frequent septic system failures with their health and environmental hazard.

Plant and Animal Problems

Stream fish habitat is very poor due to water pollution and stream channel modifications. Pollution severely limits stream fishery species and populations. No species of endangered fish were identified.

Plant communities are being altered and destroyed by urban development. Habitat loss is reducing wildlife populations. Primary damage is caused by land use changes. Habitat is destroyed by clearing, filling, and blanketing land. Wetlands and other natural areas are rapidly being destroyed.

The barn owl and red-shouldered hawk are endangered species of wildlife in Illinois which exist in the watershed. The environment which supports them (open fields, meadows, pastures, thicket, hedgerows, edges of woods, brushy abandoned fields, woods, farms, and orchards) is being destroyed by urban development.

The existing small lakes and ponds provide very little good quality fish and wildlife habitat. Many are shallow and/or polluted and cannot be managed to produce sports fisheries. Adjacent land cover has limited value as wildlife habitat in most instances.

Economic and Social Problems

General economic conditions in the watershed area are considerably above state and national levels. However, pockets of high unemployment do exist in scattered localities such as East Chicago Heights and Robbins. Overall unemployment is estimated to be only slightly above the 2.1 percent rate for the metropolitan suburban area as of mid-1974.

Median family income is estimated to be about $14,000, or about 10 percent less than for the metropolitan suburban area. The median level of education is slightly less than for the total suburban area.

Housing varies greatly within the area but can be characterized in general as being older and having lower current market value than in other suburban areas. Substandard housing exists in some areas.

Flooding knows no boundaries and impacts heavily on low income communities. Such areas do not possess the economic means to alleviate the flooding problem and it therefore compounds their disadvantaged economic condition.

Relationship to Land Use Plans, Policies and Controls

The proposed action is in compliance with the Comprehensive General Plan of the Northeastern Illinois Planning Commission. There are no known conflicts with objectives of federal, state, and local land use plans, policies or projects.

ENVIRONMENTAL IMPACT

Conservation Land Treatment

Land treatment measures will reduce erosion, sediment deposition, and provide the basis for better utilization of natural resources. Average annual sedimentation rates from land being converted from agricultural, idle and forest uses to urban uses will be reduced from 11 tons per acre to 2 tons per acre annually. Gross erosion rates on cropland and idle land will be reduced from an average of 8.4 tons per acre per year to 3.8 tons per acre per year. Approximately 8,200 acres of cropland and idle land will be adequately treated by these measures.

Establishment of permanent vegetation on land that has been removed from agricultural production but has not been developed will reduce erosion and resulting sedimentation. Aesthetic conditions of the area will be preserved and improved. Costs of removing sediment from streams and drainage facilities and floodwater retarding structures, other reservoirs, stream channels, and downstream navigation channels will be reduced. Approximately 52,700 cubic yards of sediment will be prevented from entering streams each year. Suspended solid concentrations and turbidity levels of streams and reservoirs will be decreased. More compatible development of urban areas will result. Urbanizing areas will be developed under more controlled conditions.

Resource planning assistance will provide the basis for overcoming many soil and water management hazards during the urbanizing process. Resulting communities will be more attractive and provide a more desirable environment in which to live. The quality of life of residents will be improved.

Non-Structural Measures

The flood plain management system will preserve wildlife habitat on flood plains. Since much of the high quality habitat is on flood plains, this will have considerable long range impacts on wildlife.

Flood plain use regulations will prevent damage to future developments by disallowing building in flood prone areas. Such zoning policies will prevent future flood profiles from increasing. Existing flood plain storage will be maintained. Preservation of a floodway will provide a corridor of 3,900 acres along 109 miles of streams.

Channel maintenance will reduce flood stages by maintaining stream capacities. Debris removal will make the streams more attractive for recreation uses such as canoeing. Stream ecology will be maintained and the environmental quality of the channel corridor will be enhanced.

Structural Measures

Planned structural measures will directly reduce floodwater damages on an estimated 10,800 acres of flood plain land. Approximately 6,950 residences and 142 business, commercial, and public buildings will be benefitted by the structural measures. Some 6,710 residences and all the businesses and public buildings will be completely protected from the projected 100-year frequency flood with proposed structural measures installed.

An additional 1,400 residences, 30 commercial, business and public buildings will receive benefits. They are situated in the flood plain but are not subject to inundation by the projected 100-year frequency flood. Benefits include the reduction of flooding of lawns, gardens, parking lots and residential streets.

Structural measures, together with non-structural measures, will reduce average annual damages by almost 98 percent. Projected peak discharge rates will be reduced throughout the watershed.

Traffic disruption caused by flooding of streets and highways will be reduced 64 percent. Effects are widespread. Several arterial streets which are state and federal highways will receive a significant reduction in the frequency of closure.

The water resource improvement associated with multiple purpose Structure 32 will provide the basis for about 43,700 user-days of recreation annually. A 13 surface acre reservoir and an additional 40 acres of land will be available for recreation activities. Recreation experiences available will include boating, canoeing, fishing, playgrounds, and winter sports activities.

Sediment pools associated with excavated structures and borrow areas will provide about 41 acres of surface water suitable as feeding and resting areas for migrating water fowl.

The National Park Service and the Illinois Historical Preservation Officer were notified of the intent of this plan. An archaeological survey was conducted through the Illinois Archaeological Survey of all areas that would be involved in construction of excavated floodwater structures. This survey indicated that no prehistoric or historic sites were in the immediate vicinity of the proposed structures. The National Register of Historic Places also did not list any sites within these construction areas. In accordance with Public Law 93-291, should specimens be found during construction, the Illinois Historical Preservation Officer and the National Park Service will be notified and will be given the opportunity to evaluate and salvage such items as desired.

Installation of the project measures will not directly affect any wetlands and/or any rare or endangered species of fish and wildlife or plants.

Installation of structural measures will require disturbance and commitment of land resources for construction, operation, and maintenance purposes. Present land use and stream miles modified of planned measures are shown on the following page.

PRESENT LAND USE AFFECTED BY SELECTED PLAN

Structural Measure	Total Area Used	Stream Modification	Stream Classification	Developed Land	Undeveloped Land		
					Idle Land	Agricultural Land	Water
	Acres	Miles		Acres	Acres	Acres	Acres
Structure 32	118.0	0.27[4/]	Intermittent	-	61.0	57.0	-
Structure 53	73.5	0.10[4/]	Intermittent	-	20.0	53.5	-
Structure 84	50.0	0.10[4/]	Perennial	50.0[1/]	-	-	-
Structure 143	80.0	0.10[4/]	Perennial	53.9[2/]	-	26.1	-
Midlothian Creek Channel Work 137th St. to 139th St.	-	0.23	Perennial	-	-	-	-
Diversion Conduit 139th St. to Calumet-Sag Channel	1.4	-	Perennial	1.4[3/]	-	-	-
Natalie Creek Conduit Crawford to Hamlin and 145th	0.8	-	Intermittent	0.8[3/]	-	-	-
Natalie Creek Channel Work Hamlin and 145th to Midlothian Creek	-	0.68	Intermittent	-	-	-	-
Calumet-Union Drainage Ditch Channel Work Western Ave. to Halsted	-	1.99	Perennial	-	-	-	-
TOTAL	323.7	3.47		106.1	81.0	136.6	-

1/ Limestone Quarry
2/ Sand Mine
3/ Streets and Residential
4/ Modifications incidental to structure installation

May 1975

Economic and Social

Many effects of the project measures were not assigned monetary effects. Reduced duration of flooding around residences and in parking lots of businesses and industries were not evaluated monetarily. Mosquito abatement was not assigned a monetary benefit. Effects of decreased health hazards during flood conditions were not quantified.

The quality of life of flood plain occupants throughout the watershed will be improved. Project action will reduce the fear of flooding, and property values will be maintained.

Local jobs will be created by the installation of project measures; both skilled and unskilled labor will be needed for the construction activities. Installation of project measures will provide an estimated 260 man-years of local employment. Operation and maintenance of project measures will create both full and part-time jobs and generate sales for associated industries during the life of the project. It is estimated that the operation and maintenance of project measures will provide 3.5 years of employment over the 100-year evaluation life of the project.

Externalities will result from use of the recreation development associated with Structure 32. Purchases by users of the recreation development will have a multiplier effect within the local economy.

Project measures will preserve approximately 324 acres of land for open space. Recreational uses will be made of much of this land.

Favorable Environmental Effects

1. Reduces sediment from 1,000 acres of construction areas from 11 tons to 2 tons per acre annually.

2. Reduces erosion rates on cropland and idle land from an average of 8.4 T/AC/YR to 3.8 T/AC/YR.

3. Improves water quality of streams by reducing turbidity. Approximately 52,700 cubic yards of sediment are prevented from entering streams annually.

4. Preserves 3,900 acres of corridor along 109 miles of stream.

5. Preserves and improves aesthetic qualities of 109 miles of stream.

6. Creates about 41 acres of surface water suitable for waterfowl resting and feeding areas.

7. Multiple purpose Structure 32 provides approximately 43,700 user-days of recreation annually.

8. Reduces floodwater damages about 98 percent. Protects 6,710 residences and 142 businesses from damage from a 100-year flood.

9. Augments about 4,000 GPM of flow in streams during low flow.

10. Controls future development in the flood plain.

11. Provides an average reduction of 7,300 traffic disruptions annually.

Adverse Environmental Effects Which Cannot Be Avoided

1. Installation of structural measures temporarily disturbs or destroys vegetative cover on 218 acres.

2. Sediment pools inundate 41 acres and the recreation pool inundates 13 acres.

3. Installation of structural measures causes localized short term increases in runoff, erosion, sediment, and turbidity.

4. Recreation activity generated by Structure 32 increases traffic noise and dust.

5. Increases traffic noise and dust during construction.

6. Converts 0.38 miles of earth channel to concrete lined.

ALTERNATIVES

The following alternatives were considered for use in comparing effects of the Selected Plan:

1. No Project

2. Accelerated Land Treatment Alone

3. Non-Structural Measures for Minimizing Flood Losses

4. Environmental Quality Plan (Plan A)[3/]

5. Modified National Economic Development Plan (Plan B)[3/]

6. Selected Plan (Plan C)[3/]

1. No Project. This alternative would allow existing problems and trends to continue. Future flood damages will be greater because of upland development and uncontrolled and uncoordinated development in the flood plain. Projections indicate that about 1,000 acres of agricultural, idle land, and woodland will be converted to urban uses each year. Potential problems associated with this land conversion include flood plain development, urban development in areas with water management hazards and soil limitations, excessive erosion and sedimentation, and general natural environmental deterioration.

Present conservation programs do not effectively control erosion on cropland and idle land. Trends indicate that future erosion rates on cropland and idle land will not decrease because the land is being held for potential urban development. Almost all undeveloped land is owned by investors.

A comparison of project costs and project benefits shows that about $1,018,800 of annual net national economic benefits would be foregone by not implementing project measures. Net benefits to the Chicago metropolitan region foregone by not implementing project measures is estimated to be $3,430,700 annually.

3/ Refer to Little Calumet River Watershed Floodwater Management Plan.

2. Accelerated Land Treatment Alone. This alternative consists of (1) legal requirements establishing allowable sedimentation rates from land undergoing urban development, (2) legal requirements establishing erosion rates on cropland and idle land, and (3) resource conservation planning assistance to units of government and land users. Amounts of erosion and sedimentation on cropland, idle land, and urbanizing land would be controlled by this alternative. Flood protection provided would be insignificant.

Environmental effects resulting from these measures include improved aesthetics of the area by reducing erosion and sedimentation. Approximately 52,700 cubic yards of sediment will be prevented from entering streams each year. Turbidity levels of streams and reservoirs would be reduced.

Resource planning assistance will provide the basis for more compatible urban development. Water management hazards and soil limitations can be planned for and associated problems prevented. Unique and desirable environmental resources will be recognized and their protection can be adequately considered.

Total annual cost of this alternative is estimated to be $111,900. This cost consists of $25,800 for annual technical assistance and $86,100 for annual installation costs.

3. Non-Structural Measures for Minimizing Flood Losses. This alternative consists of (1) land treatment, (2) flood plain use regulations, (3) flood proofing, and (4) channel maintenance. The land treatment program is identical to Alternative 2. Flood plain use regulations and flood proofing will prevent future flood damages from increasing by (1) controlling development in the flood plain, and (2) preserving a floodway for conveyance of flood waters. Flood insurance will not reduce flooding, only spreads the cost over society. Channel maintenance will stabilize conveyance conditions and prevent channel deterioration.

Environmental impacts of flood plain use regulations, flood proofing and channel maintenance are minimal. Flood plain use regulations will require the preservation of a corridor along streams. Environmental impacts of the land treatment are described in Alternative 2.

Total cost of this alternative is estimated to be $415,300 annually. Technical assistance is estimated to cost $314,800 including $202,900 for flood proofing assistance.

4. Environmental Quality Plan (Plan A). This alternative includes (1) purchase of Homewood Sand Spit, (2) purchase of 978 acres of native hardwoods, (3) purchase of 54 acres of Types 3, 4, and 5 wetlands plus an additional 54 acres of land to serve as a buffer, (4) channel maintenance program, (5) a land treatment program, and (6) low flow autmentation in Midlothian Creek. Flood protection provided by this alternative is insignificant.

Environmental impacts are shown below:

Components	Measures of Beneficial and Adverse Effects
Areas of Natural Beauty	1. Preserves 20 acres of fossil sand dune.
	2. Preserves 6 acres of original prairie.
	3. Provides 12 acres of open space in park forming a buffer between residential land and Washington Park Race Track.
	4. Enhances visual quality of new reservoir at 167th and Cicero and 10 miles of stream (Midlothian Creek).
	5. Disturbs vegetation on 2 acres during construction.
	6. Improves aesthetics of area by reducing erosion and sedimentation.
	7. Preserves and improves aesthetic qualities of 109 miles of stream.
	8. Provides 1,078 acres of open space.

Quality Considerations of Water, Land and Air Resources	1. Improves water quality of 167th and Cicero reservoir. 2. Puts a new demand on groundwater (pumping). 3. Augments stream flow by 40 gallons per minute during low flow periods. 4. Prevents 52,700 tons of sediment from entering streams each year. 5. Reduces erosion rates on agricultural and idle land from an average of 8.4 T/AC/YR to 3.8 T/AC/YR. 6. Reduces sediment leaving construction sites from 11 T/AC/YR to 2 T/AC/YR. 7. Provides resource data for more compatible urban development. 8. Reduces turbidity of streams and reservoirs.
Biological Resources and Selected Ecosystems	1. Preserves 978 acres of prime woodland, wildlife habitat and relatively undisturbed needed timber. 2. Preserves 54 acres of prime wildlife habitat utilized by squirrel, rabbit, raccoon, water fowl and songbirds.

3. Improves sport fishery in 167th and Cicero reservoir.

4. Enhances existing channel ecosystem.

Irreversible or Irretrievable Commitments Resources

Monetary and other resources needed to implement the plan. of

5. Modified National Economic Development Plan (Plan B). This alternative includes excavated floodwater Structures 53, 84, and 143 and multiple purpose Structure 32 plus flood plain regulations and flood proofing. Channel work on 1.8 miles of Midlothian Creek and Natalie Creek tributaries is planned. Flood protection includes protecting 6,695 residences and 142 businesses from the projected 100-year flood. About 6,140 traffic disruptions will be eliminated annually. The basis will be provided for 43,700 user-days of recreation annually.

This alternative will have the following impacts. Vegetation on 120 acres will be temporarily disturbed during construction. Erosion and sedimentation will increase during construction. The level of groundwater will be lowered near structures. Approximately 200 acres of open space will be preserved. Approximately 4,000 GPM of additional permanent flow will be added to the streams. Approximately 80 acres of water capable of supporting fish life will be provided. Approximately 41 acres of land will be committed to sediment pools, and 15 acres will be committed to a recreation pool. The ecosystem of 3.6 miles of channel will be altered during and immediately after construction.

Total installation cost of this alternative is estimated to be $28,712,800. Operation and maintenance costs are estimated to be $165,200 annually. Technical assistance for flood proofing will cost $7,500 annually.

6. Selected Plan (Plan C). This alternative includes measures in Alternatives 3 and 5 and additional channel modifications of (1) substituting a diversion conduit on the Midlothian Creek channel from 137th Street to the Calumet-Sag Channel in lieu of channel modification from 137th Street to the Rock Island Railroad, and (2) enlargement of approximately two miles of the Calumet-Union Drainage Ditch from Western Avenue to Halstead Street.

Flood protection includes protecting 6,710 residences and 142 businesses from the projected 100-year flood. About 7,300 traffic disruptions will be eliminated annually.

Environmental impacts of this alternative include those in Alternative 6 in addition to the effects on two miles of the Calumet-Union Drainage Ditch.

Total installation cost of this alternative is estimated to be $30,647,800. Operation and maintenance costs are estimated to be $207,900. Technical assistance will be $118,900 annually.

SUMMARY OF ALTERNATIVES

Alternative	Component Means	Installation Costs	O&M (Annual)	Technical Assistance	Houses Protected (100-year Flood)
1	No Project.	-	-	-	-
2	Accelerated Land Treatment Alone.	-	-	$111,900[1/]	-
3	Non-Structural Measures.	-	$100,500	314,800[1/]	-
4	Environmental Quality Plan - (Plan A).	$ 6,891,400	22,800	111,900[1/]	-
5	Modified National Economic	28,712,800[2/]	165.200	7,500	6,695
6	Selected Plan (Plan C).	30,647,800[2/]	207,900	118,900[1/]	6,710

1/ Includes $86,100 which is the annual cost of installing the land treatment program.

2/ Includes $101,800 for installation of recreation facilities.

Short Term Vs. Long Term Use of Resources

Land use in the Little Calumet River Watershed is rapidly changing. Approximately 1,000 acres of agricultural, idle, and woodland are being converted to urban uses each year. Cropland is being converted to idle use because of (1) farming units becoming uneconomical, and (2) land is purchased for future urban development. Urbanization is occurring without provisions for adequate amounts of open space. Some open space being provided is not strategically located.

This project is consistent with the Northeastern Illinois Planning Commission Comprehensive General Plan and the Regional Open Space Plan. The project is not only consistent, but actually complements the plans in that development within flood plains is controlled and project measures preserve open space.

Long term goals for land use and flood control are complemented by the project. Flood plain use regulations will require an adequate floodway be preserved to safely convey floodwaters without creating adverse effects to future development. Development that occurs on the floodway fringe will be constructed at elevations sufficiently high to prevent flood damage.

With proper maintenance, structural measures will continue to function with decreasing effectiveness after the end of the 100-year design period. Planned sediment storage capacity will be exhausted by the end of the 100-year evaluation period. Sediment will then gradually begin encroaching on flood pools, thus reducing flood storage. Sediment removal will prolong effective life of the reservoirs.

To date, no PL-566 watershed project measures have been installed in this portion of northeastern Illinois. Three small watersheds, covering a total of 777 square miles, are authorized for SCS planning assistance and work plans are scheduled for completion during 1975. A total of nine watersheds covering 1,451 square miles have applications approved for planning assistance by Illinois and Wisconsin. Preliminary investigation reports of these watersheds are currently being prepared or scheduled for preparation.

This watershed is the second unit of the on-going cooperative Type 4 River Basin Study. The North Branch of the Chicago River Floodwater Management Plan has been completed. Two other cooperative River Basin studies are under way in the same general area. The Kankakee-Elkhart River Basin Study includes portions of Illinois and Indiana, and the Southeast Wisconsin River Basin Study includes the Wisconsin portion of the Fox and Des Plaines River Basins. The purpose of these studies is to identify the water and related land resource problems and needs and to determine opportunities to satisfy needs.

Irreversible and Irretrievable Commitments of Resources

Installation of project measures will utilize approximately 324 acres including construction areas, sediment pools, recreation pools, and channel dedication. Each of these uses commits land resources to varying degrees.

About 30 acres will be permanently committed to spillways, embankments, channel, access facilities and structural apurtenances. Approximately 159 acres will be committed to reservoirs of which 41 acres will be committed to sediment pools and 13 acres to recreation pools. The remaining 113 acres will also be available for other uses such as recreation and open space.

Approximately 3,900 acres of land will be preserved as floodways. This land will remain available for low hazard, low intensity uses, but not for intensive development.

Installation of project measures will require commitment of 260 man-years of labor. Approximately $30,647,800 of capital is needed to install project measures. Economic returns to the invested capital will be approximately $1.50 for each $1.00 committed.

Consultation and Review with Appropriate Agencies and Others

The Little Calumet River is one of six watersheds encompassed by the Cooperative Studies for Preparation of the Chicago Metropolitan Area River Basin Plan. The Soil Conservation Service, USDA, entered into a cooperative agreement with the Metropolitan Sanitary District of Greater Chicago, in March of 1971, for this Type 4 River Basin Study.

Coordination with potential local project sponsors, interested agencies, and individuals was accomplished by establishing a steering committee in the watershed. This steering committee is composed of interested local citizens, municipal leaders, county government leaders, regional planning commission representatives, and known environmental group leaders. The committee holds regular monthly meetings at locations throughout the watershed area. Written notices of these meetings were sent to all members. Press coverage has been actively sought.

Coordination meetings were held at appropriate intervals with federal and state agencies with responsibility for water resource management. These included meetings with the State of Illinois, Department of Transportation, Division of Waterways; the Chicago District of the Corps of Engineers; and the U.S. Geological Survey. Throughout the planning process, individual local contacts were made with soil and water conservation district, forest preserve districts, drainage districts, sanitary districts, park districts, municipal planning commissions, and interested citizens. In addition, coordination was accomplished by correspondence with such agencies as the Illinois Natures Preserve Commission and the Illinois Archaeological Survey.

GLOSSARY OF TERMS

Benefit-Cost Analysis - Comparison of the expected benefits of a project with the anticipated costs. Ordinarily, unless the computed benefits exceed the computed costs, the project is not feasible.

Compensatory Storage - Storage volume within the flood plain which is excavated to replace storage lost as a result of a land filling operation or construction project within the flood plain.

Cost Allocation - The apportionment of the costs of a multi-purpose water project among the various purposes served.

Cost-Sharing - The assignment of the responsibility for paying the costs of a water project among two or more entities as for example among the federal government, a state government, and individual users.

Developed Land - As used herein includes the following uses of land: (1) residential, (2) manufacturing, (3) commerce, (4) public buildings, (5) open space, (6) transportation, communication, and utilities, and streets. Definitions are based on commitment of land to a designated use rather than land cover.

Discharge - The rate of flow of a spring, stream, canal, sewer, or conduit.

Discount Rate - The interest rate used in evaluation of water (and other) projects for the purpose of calculating the present value of future benefits and future costs, or otherwise converting benefits and cost to a common time basis.

Drainage - The act, process, or mode of draining to carry away excess water.

Endangered - In danger of extermination from Illinois.

Erosion - The wearing away of soil by the action of water and wind.

Evaluation - Examination of a proposed project to determine costs and effects.

Excavated Floodwater Retarding Structure - A flood control measure which provides flood control by storing and retarding excess flood flows and which is constructed by the excavation of the storage reservoir.

Flood Plain - That portion of land adjacent to a stream which would be inundated by overbank flooding from a 100-year flood.

Flood Plain Encroachment - Acts such as land filling and construction in the flood plain which restrict the conveyance ability of the flood plain and/or reduce the storage capacity of the flood plain.

Flood Plain Management - Includes a full range of tools, programs, and policies all working harmoniously together toward a common goal -- flood damage prevention. These tools, programs, and policies include such things as: (1) land use controls, (2) land acquisition or easement programs, (3) urban renewal, (4) tax adjustments, (5) financing controls for buildings by lending institutions where mortgage guarantees or funds to developers are not made available in flood prone areas or where flood protection measures are omitted from building proposals, (6) public policy guiding the construction and location of public facilities and services out of flood prone areas, (7) flood control measures and flood proofing of existing structures, (8) evacuation, (9) flood insurance, and (10) flood warning systems.

Floodway - That portion of the flood plain immediately adjacent to the stream which conveys flood flows when channel capacities are exceeded.

Floodway Fringe - That portion of the flood plain outside of the floodway which acts primarily to store floodwaters when channel capacities are exceeded.

Forest Preserve District - A unit of county government which owns and operates land for conservation, education and recreation.

Foundation Drains - Those drains around the foundations of buildings which are utilized to collect seepage water.

Ground Water - Water that occurs beneath the land surface and completely fills all pore spaces of the material in which it occurs.

Incidental Recreation Benefits - Recreation benefits which occur without intention as a consequence of installing project measures. Such benefits are evaluated and counted in economic justification, provided public access and use are assured.

Intermittent Stream - Stream that flows and ceases to flow at intervals throughout the year and is primarily dependent upon excess runoff from storms to sustain it.

Land Treatment - The management, operation and installation of conservation measures designed to prevent excess runoff and erosion and assure proper land use.

Multiple Use - In the case of water resources, development of a particular water resource to serve two or more purposes simultaneously.

On-Site Detention - The temporary storage of excess floodwater by restricting outlets and providing storage areas. In some cases, this is required for new developments to prevent runoff rates from exceeding those from natural conditions, prior to construction.

Open Space - Publicly owned land with less than one percent of total land area covered by buildings. This is the definition used by the Northeastern Illinois Planning Commission in their Regional Open Space Plan.

Perennial Stream - A stream which carries flow continuously throughout the year.

Project Measures - Those works which are planned to be installed.

Rare - Plants or animals with very restricted range and/or numbers in Illinois.

Sediment - Material carried and deposited by water.

Sediment Pool - That portion of storage in a reservoir which is allocated for sediment accumulation.

Spoil - Land fill made from excavated material.

Storage - The impoundment in surface reservoirs or accumulation in underground reservoirs of water for later use or release.

Undeveloped Land - As used herein, includes: (1) idle land, (2) agricultural land, and (3) private forest land.

Wastewater Management - Treatment of domestic and industrial sewage and effluent.

Watershed - A region or area bounded peripherally by a water parting ridge and draining ultimately to a particular water course or body of water. The drainage area of a particular stream or water body.

Water Table - The upper surface of a zone of saturation.

Wetland - Lowlands covered with shallow and sometimes temporary or intermittent waters -- permanent waters of streams, reservoirs, and deep lakes are not included.

Works of Improvement - See Project Measures.

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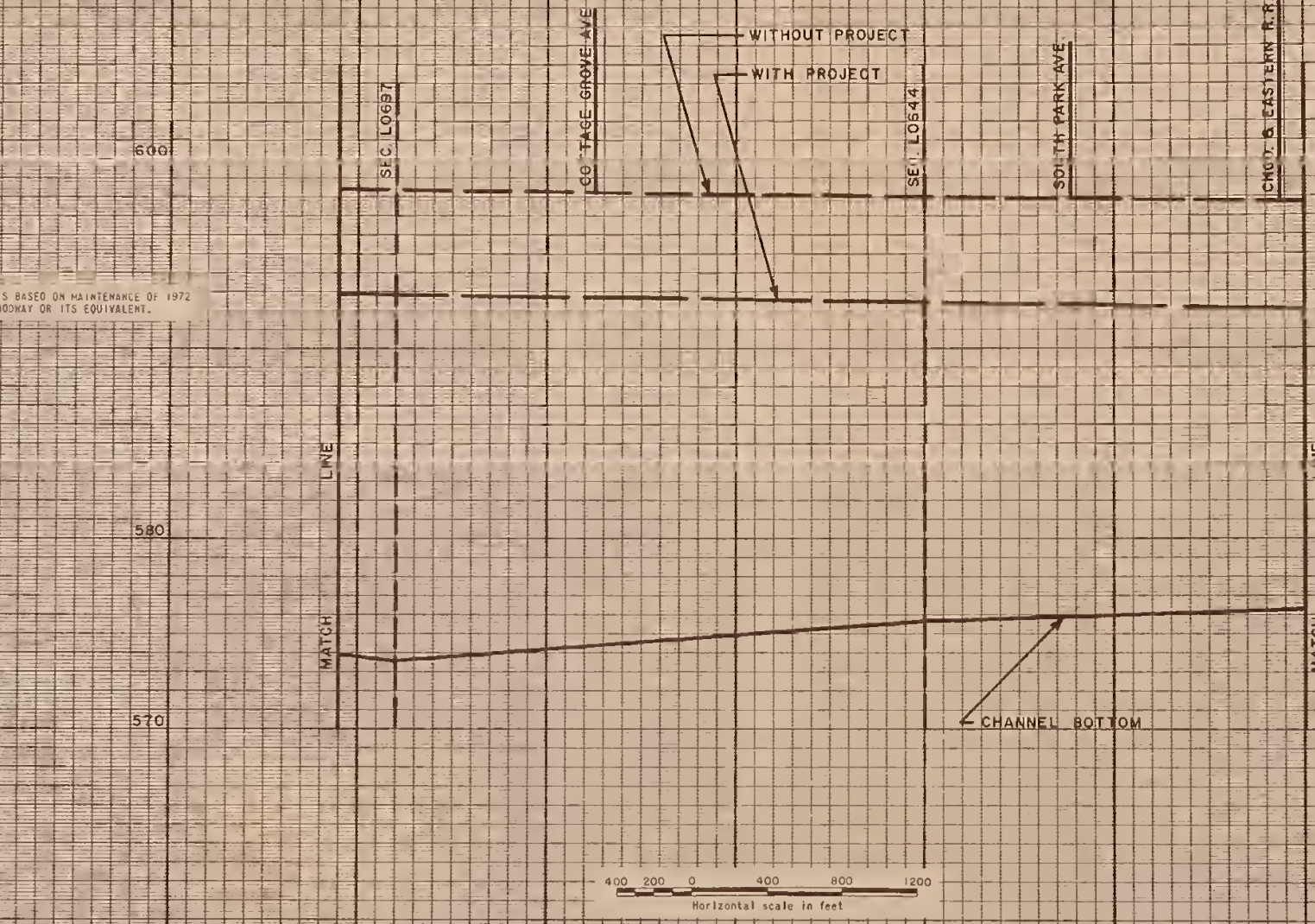
☆ GPO : 1975-652-453

PREPARED BY: CHICAGO AERIAL SURVEY, 2140 WOLF RD, DES PLAINES, ILLINOIS 60018	DATE OF PHOTOGRAPHY: APRIL 1972 DATE OF MAPPING: MAY 1972	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE IN COOPERATION WITH PREPARED FOR THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO	FLOODPLAIN TOPOGRAPHIC MAP LITTLE CALUMET RIVER, WILL AND COOK COUNTIES, ILL.	SHEET LC-5

S.P-35,003



FLOOD PROFILE IS BASED ON MAINTENANCE OF 1972 CHANNEL AND FLOODWAY OR ITS EQUIVALENT.

WHEN DETERMINING A SAFE ELEVATION FOR NEW CONSTRUCTION, THE LOWEST ELEVATION WHERE FLOODWATER MAY ENTER SHOULD BE A MINIMUM OF 2 FEET ABOVE THE FLOOD PROFILE ELEVATION.

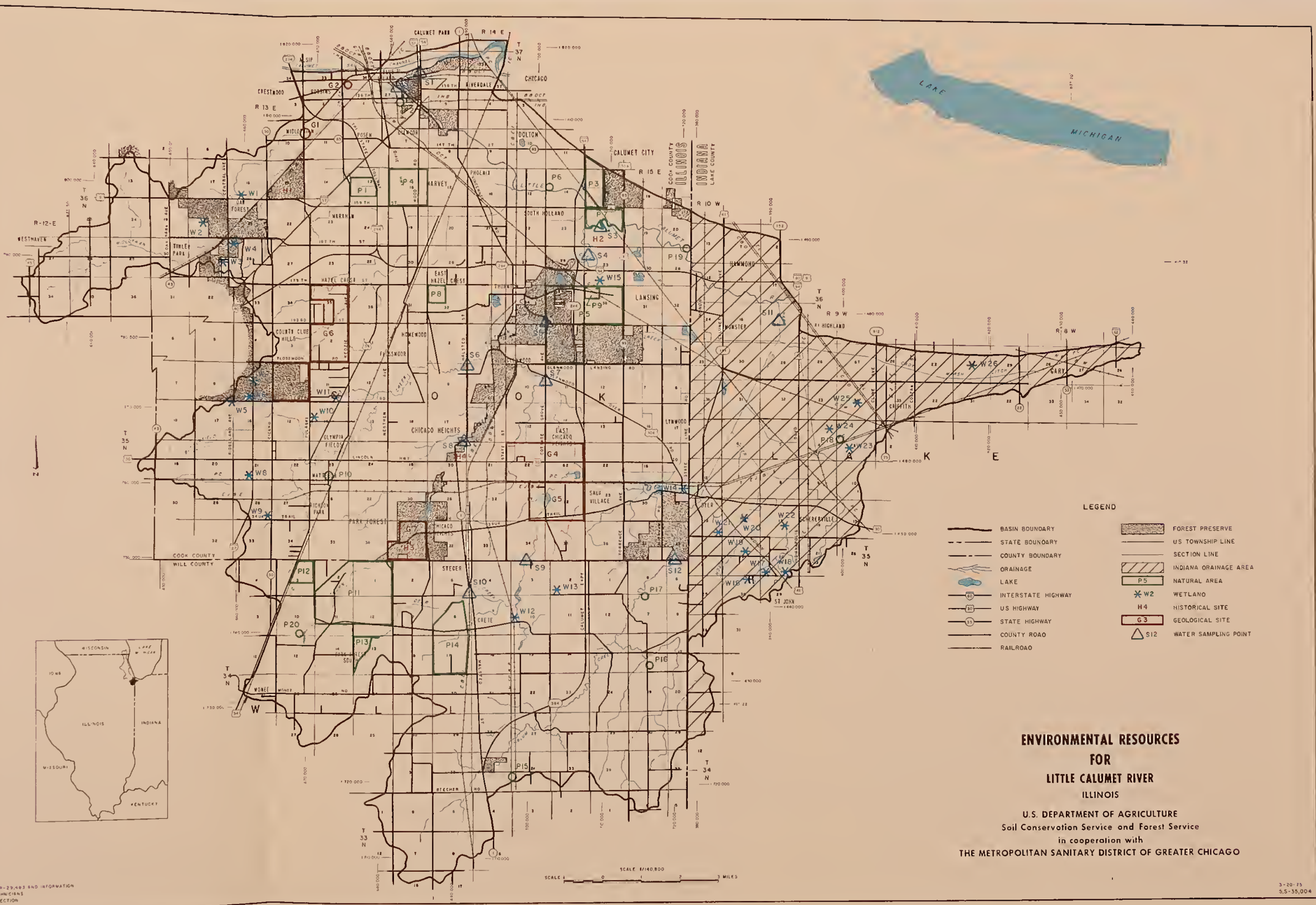
FLOOD PLAIN SHEET LC-5

FLOOD PROFILE
100-YEAR FREQUENCY
LITTLE CALUMET RIVER
WILL AND COOK COUNTIES, ILLINOIS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Compiled	Checked	Date	Drawing No

SAMPLE
(100 YEAR DISCHARGES SHOWN HERE)

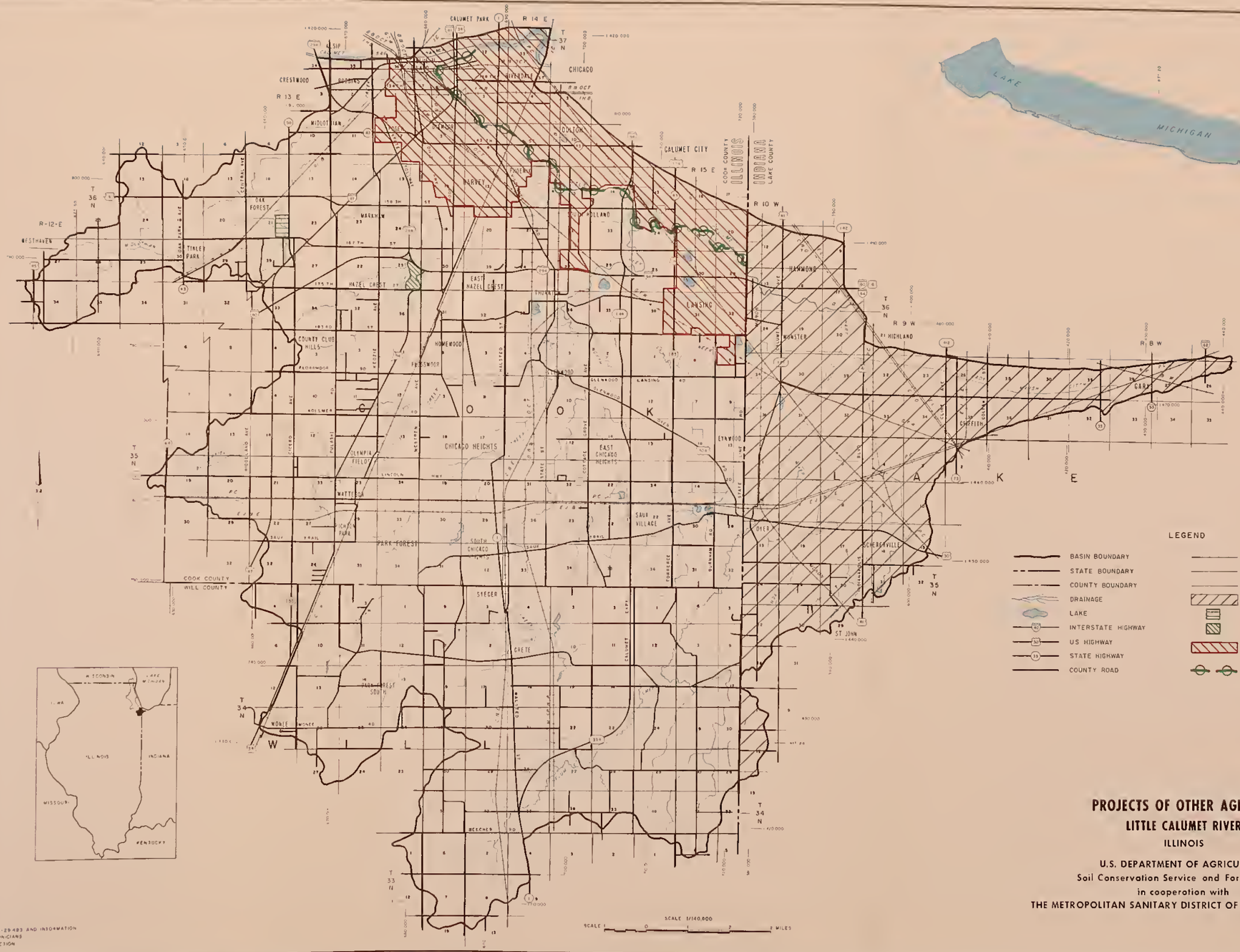


ENVIRONMENTAL RESOURCES
FOR
LITTLE CALUMET RIVER
ILLINOIS

U.S. DEPARTMENT OF AGRICULTURE
Soil Conservation Service and Forest Service
in cooperation with
THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

SOURCE
SCS DRAWING S.D-29,483 AND INFORMATION
FROM FIELD TECHNICIANS
POLYCONIC PROJECTION

3-20-75
S.S-35,004



LEGEND

- BASIN BOUNDARY
- STATE BOUNDARY
- COUNTY BOUNDARY
- DRAINAGE
- LAKE
- INTERSTATE HIGHWAY
- US HIGHWAY
- STATE HIGHWAY
- COUNTY ROAD
- RAILROAD
- US TOWNSHIP LINE
- SECTION LINE
- INDIANA DRAINAGE AREA
- STATE OF ILLINOIS SITE
- M S D STRUCTURE SITE
- AREA SERVED BY COMBINED SEWERS
- US ARMY CORPS OF ENGINEERS DEBRIS REMOVAL

PROJECTS OF OTHER AGENCIES

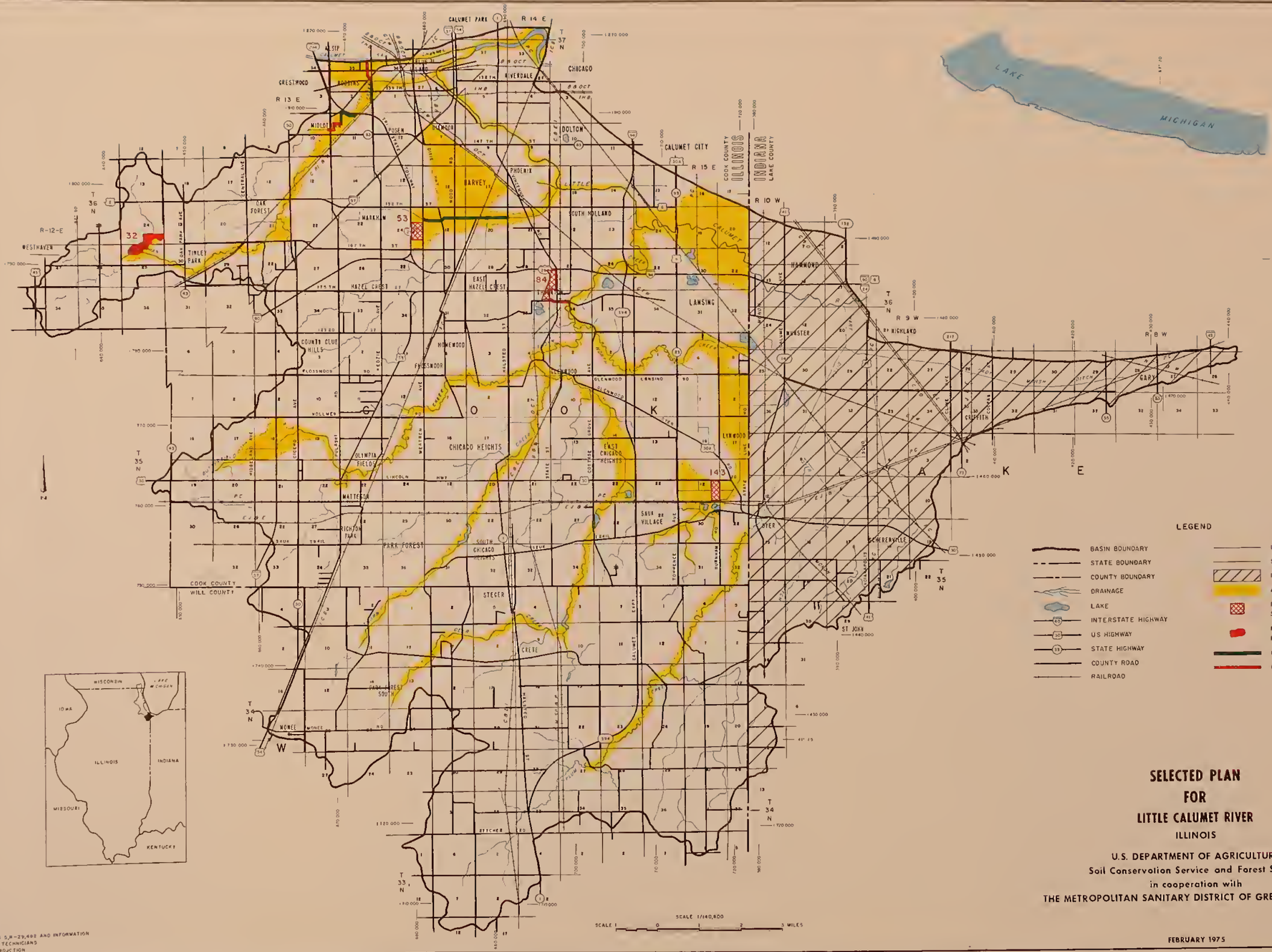
LITTLE CALUMET RIVER

ILLINOIS

U.S. DEPARTMENT OF AGRICULTURE
Soil Conservation Service and Forest Service
in cooperation with
THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

SOURCE
SCS DRAWING SJR-29483 AND INFORMATION
SSCM FIELD TECHNICIANS
POLYCONIC PROJECTION

3-26-75
5,5-35,006



LEGEND

- BASIN BOUNDARY
- STATE BOUNDARY
- COUNTY BOUNDARY
- DRAINAGE
- LAKE
- INTERSTATE HIGHWAY
- US HIGHWAY
- STATE HIGHWAY
- COUNTY ROAD
- RAILROAD
- US TOWNSHIP LINE
- SECTION LINE
- INDIANA DRAINAGE AREA
- AREA BENEFITTED
- FLOODWATER RETARDING STRUCTURE
- MULTIPLE PURPOSE RESERVOIR
- CHANNEL MODIFICATION
- DIVERSION CONDUIT

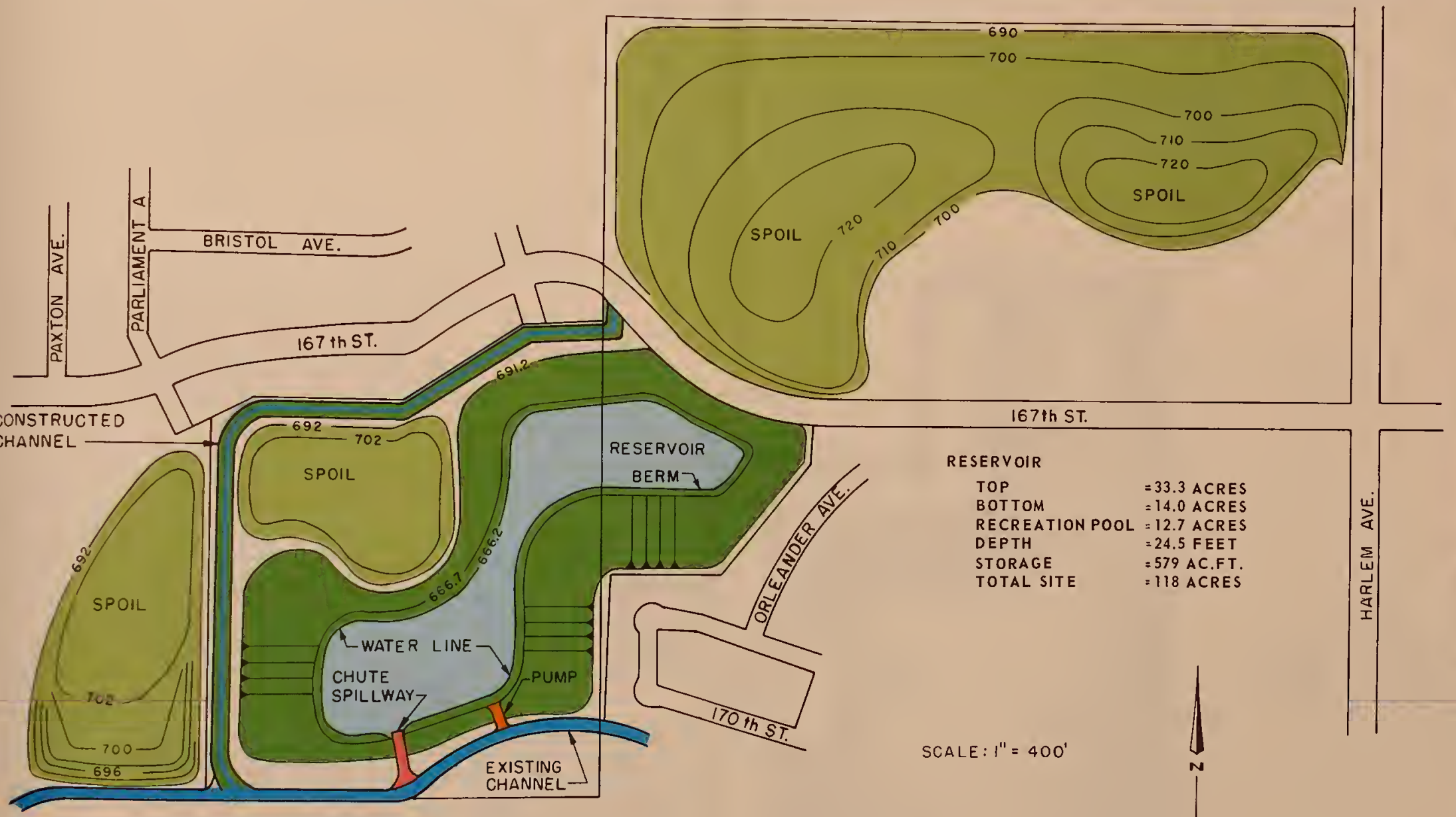
SELECTED PLAN
FOR
LITTLE CALUMET RIVER
ILLINOIS

U.S. DEPARTMENT OF AGRICULTURE
Soil Conservation Service and Forest Service
in cooperation with
THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

FEBRUARY 1975

8-21-73
5,S-35,005

SOURCE
SCS DRAWING 5,R-29,402 AND INFORMATION
FROM FIELD TECHNICIANS
POLYCONIC PROJECTION



STRUCTURE 32

FLOODWATER MANAGEMENT PLAN

MIDLOTHIAN CREEK

LITTLE CALUMET RIVER WATERSHED

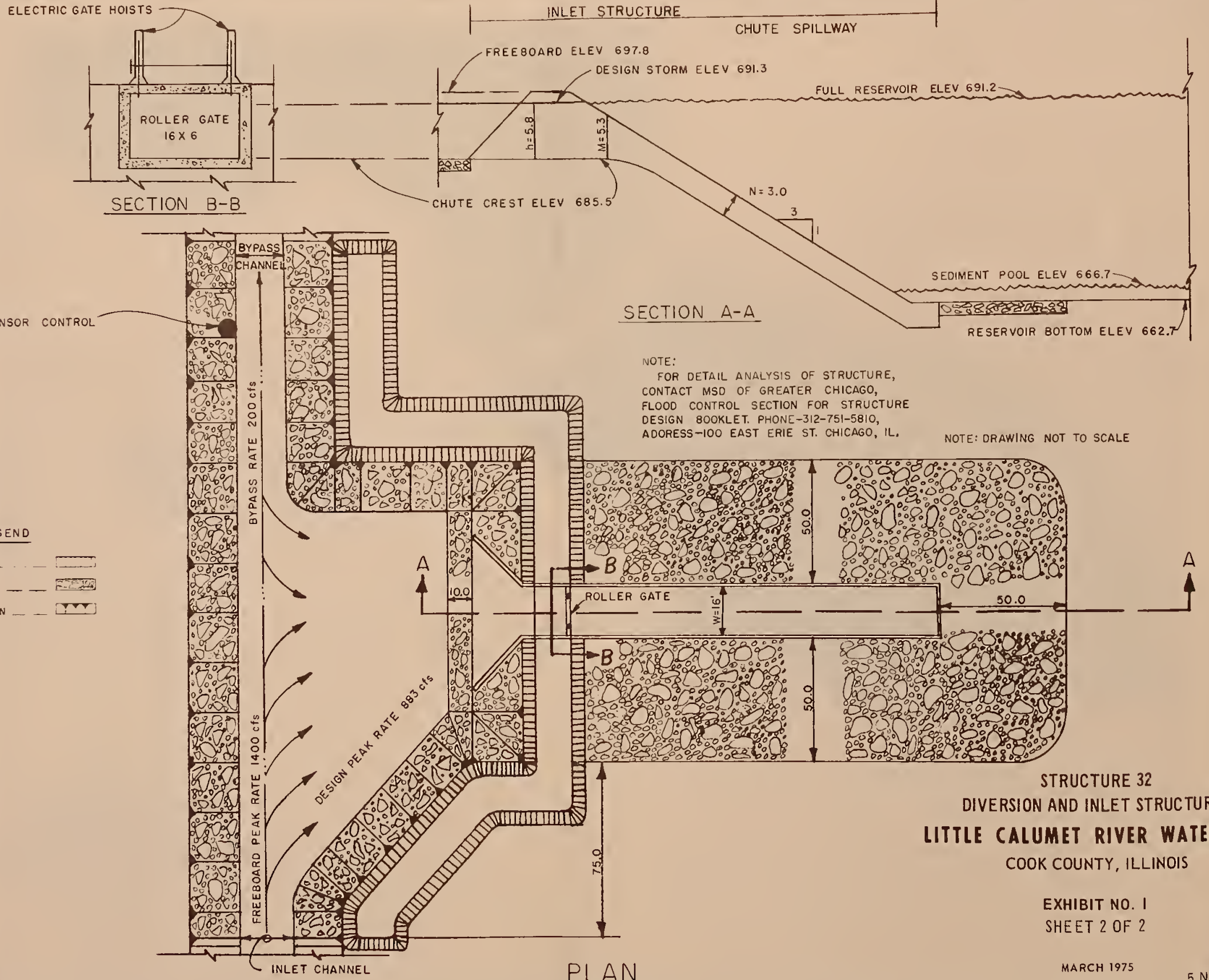
COOK COUNTY, ILLINOIS

EXHIBIT 1

SHEET 1 OF 2

MARCH 1975

5,N-35,143.1



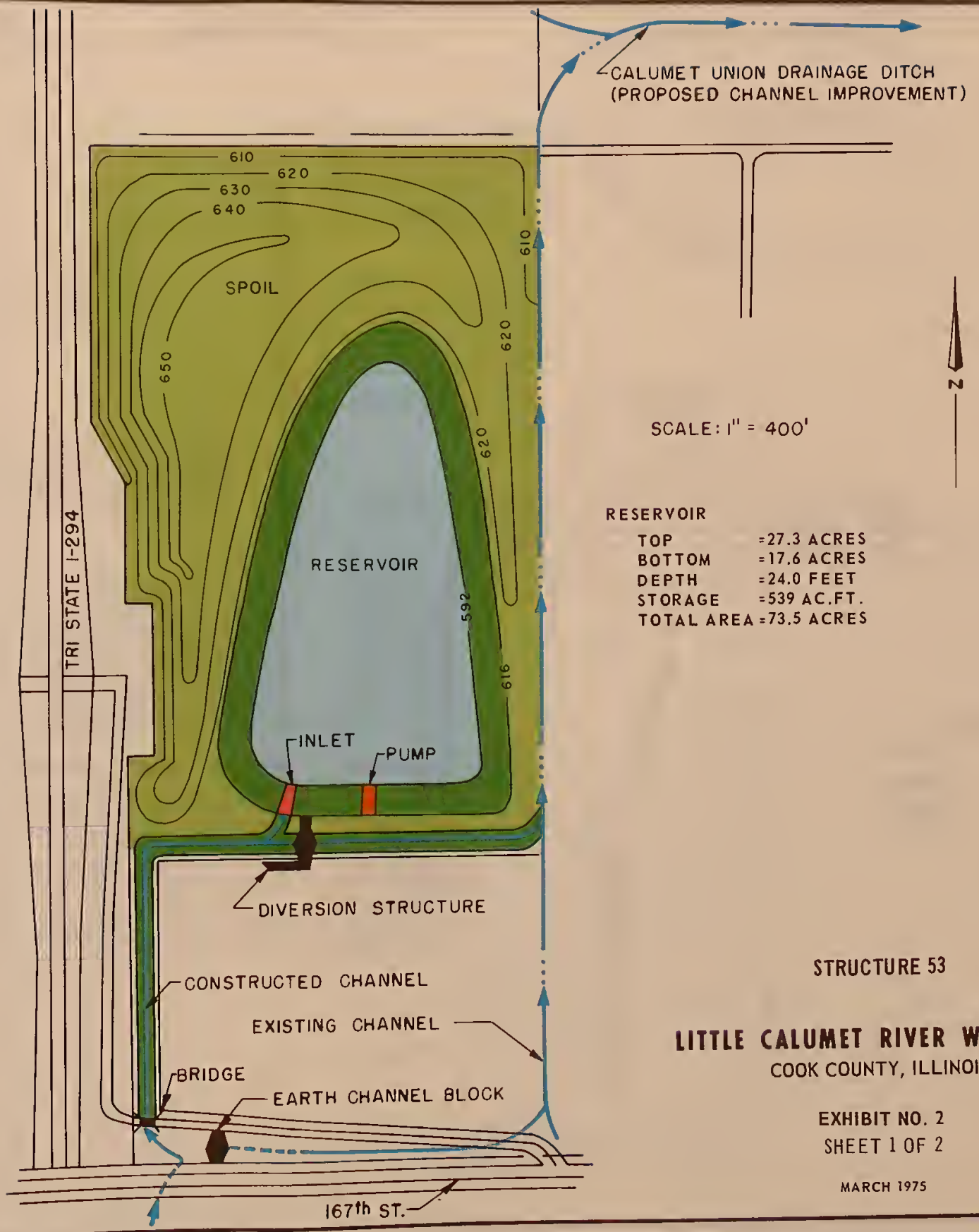
STRUCTURE 32
DIVERSION AND INLET STRUCTURE
LITTLE CALUMET RIVER WATERSHED
COOK COUNTY, ILLINOIS

EXHIBIT NO. 1
SHEET 2 OF 2

MARCH 1975

5,N-35,143.2

USDA SCS-LINCOLN, NEBR 1975



RESERVOIR

TOP	=27.3 ACRES
BOTTOM	=17.6 ACRES
DEPTH	=24.0 FEET
STORAGE	=539 AC.FT.
TOTAL AREA	=73.5 ACRES

STRUCTURE 53

LITTLE CALUMET RIVER WATERSHED

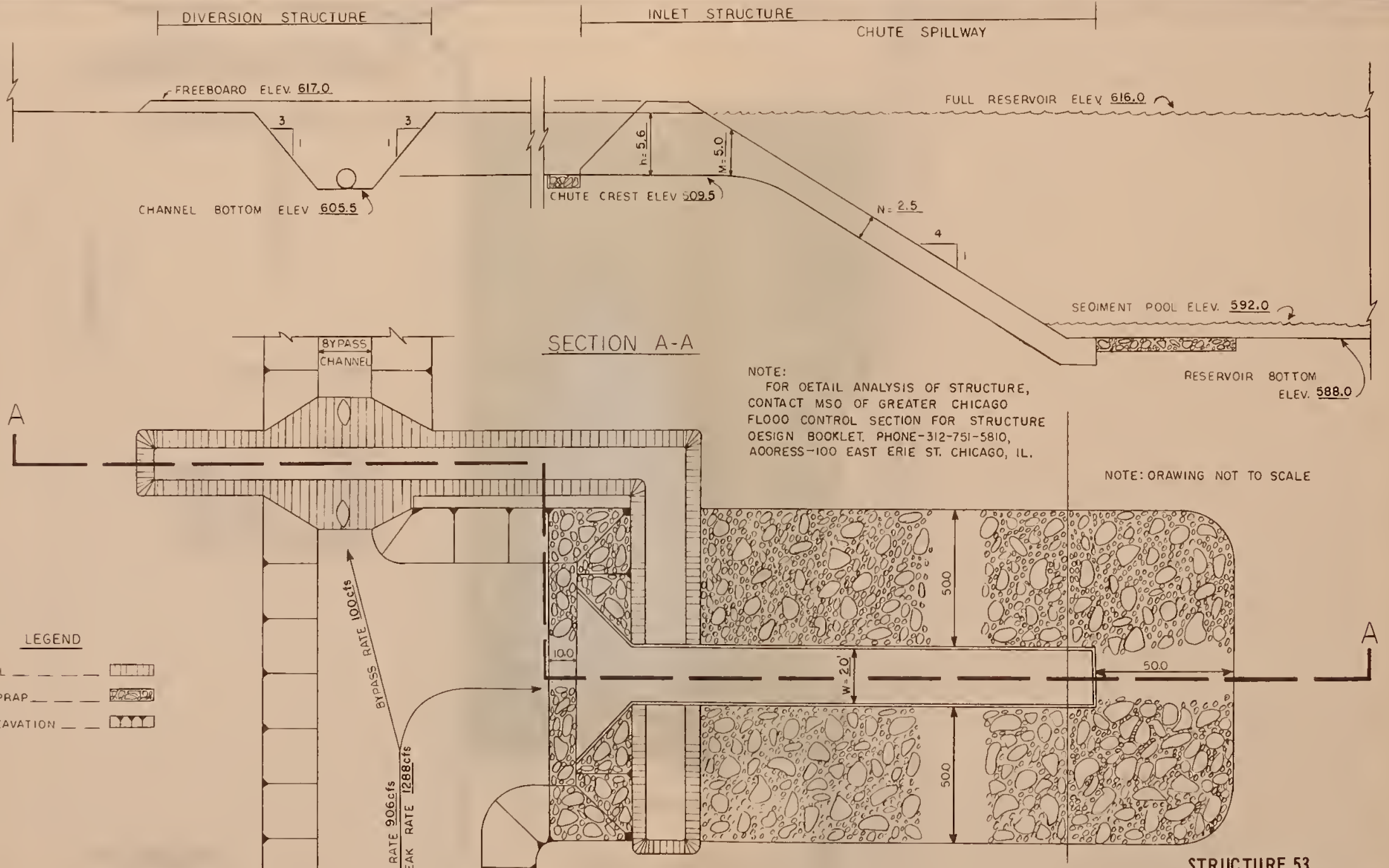
COOK COUNTY, ILLINOIS

EXHIBIT NO. 2

SHEET 1 OF 2

MARCH 1975

5,N-35,143.3



STRUCTURE 53
DIVERSION AND INLET STRUCTURE

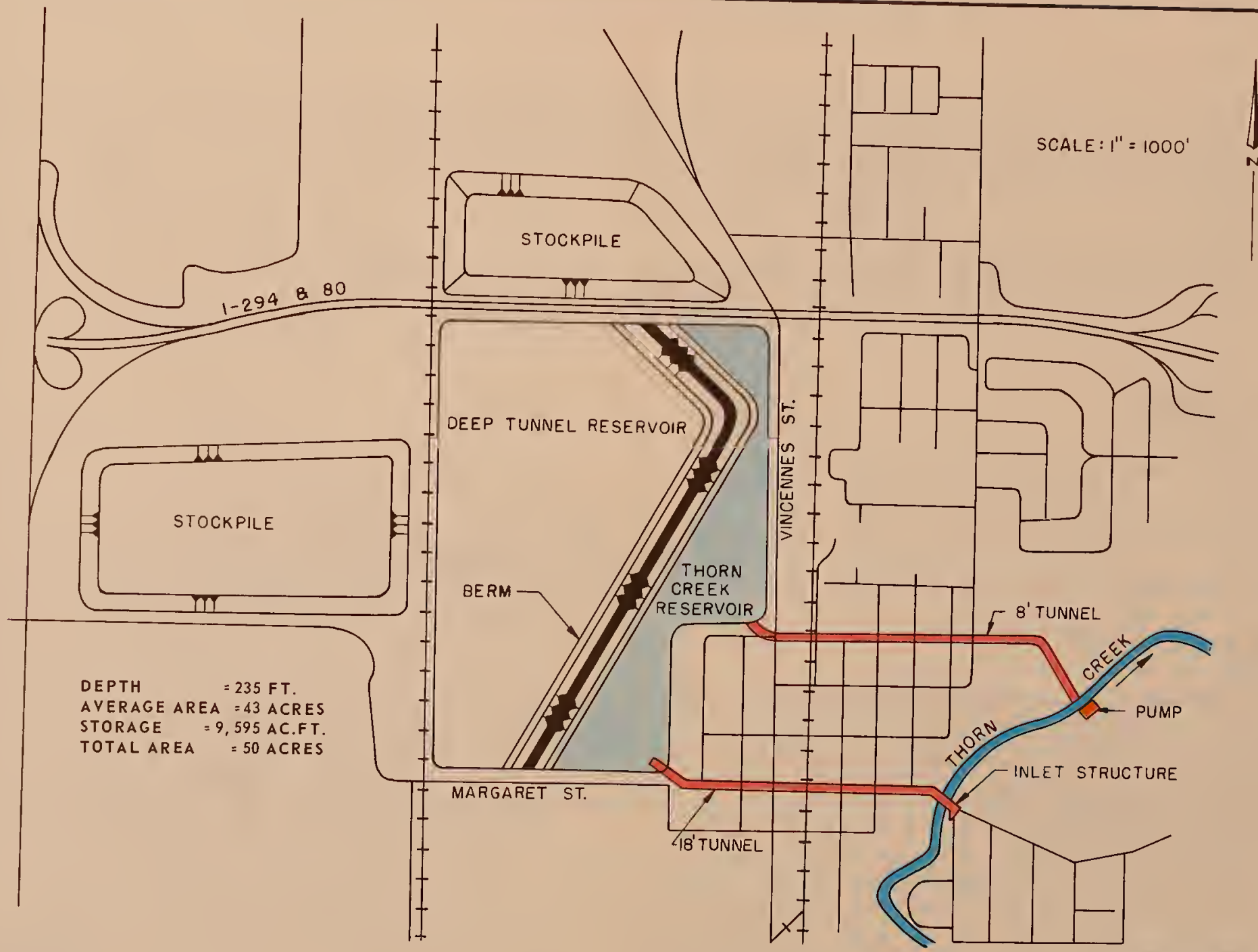
LITTLE CALUMET RIVER WATERSHED
COOK COUNTY, ILLINOIS

EXHIBIT NO. 2
SHEET 2 OF 2

MARCH 1975

5,N-35,143.4

USDA SCS LINCOLN NEBR 1975



STRUCTURE 84
THORN CREEK RESERVOIR

LITTLE CALUMET RIVER WATERSHED

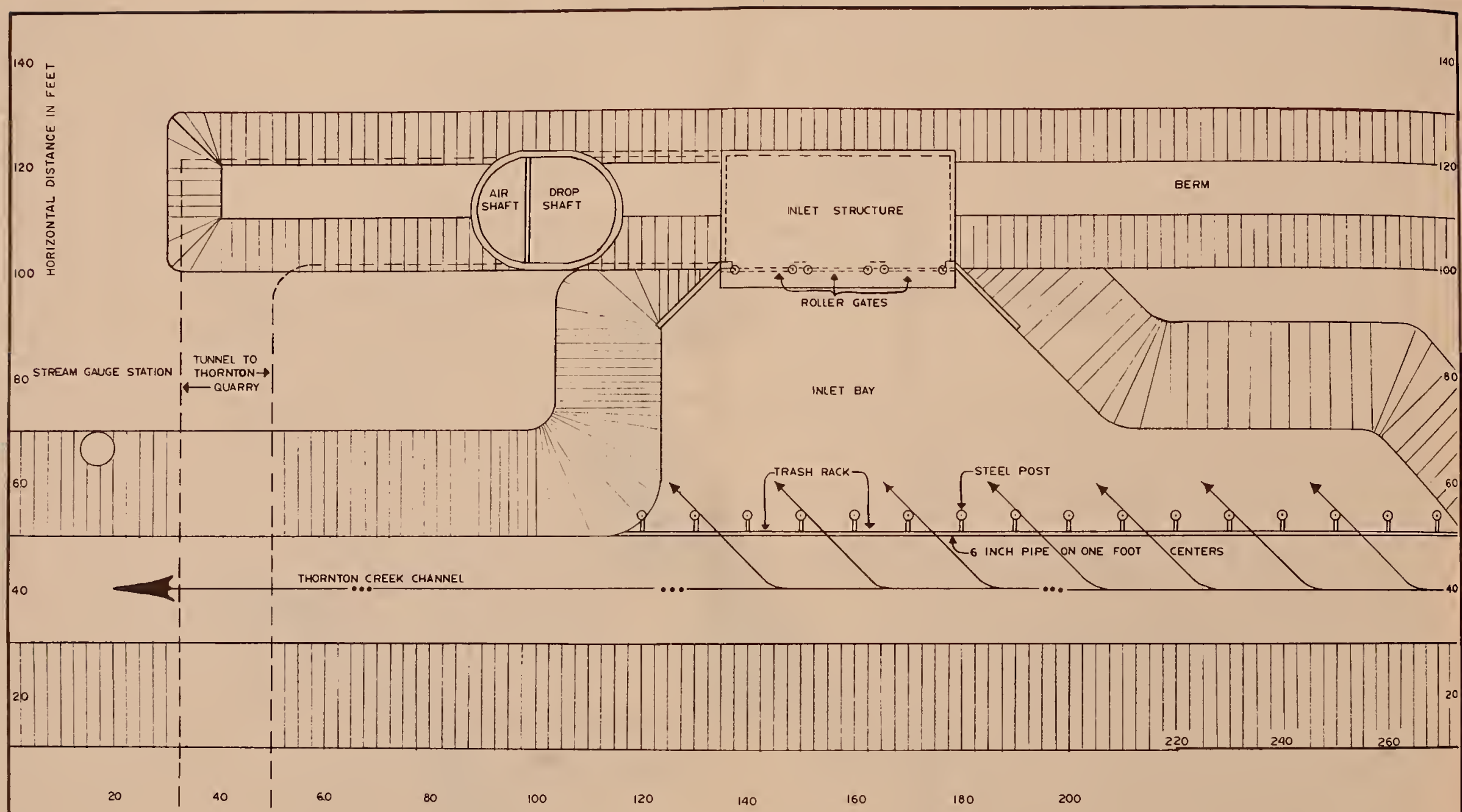
COOK COUNTY, ILLINOIS

EXHIBIT NO. 3

SHEET 1 OF 3

MARCH 1975

5,N-35,143.5



PLAN VIEW

STRUCTURE 84
INLET WORKS

LITTLE CALUMET RIVER WATERSHED

COOK COUNTY, ILLINOIS

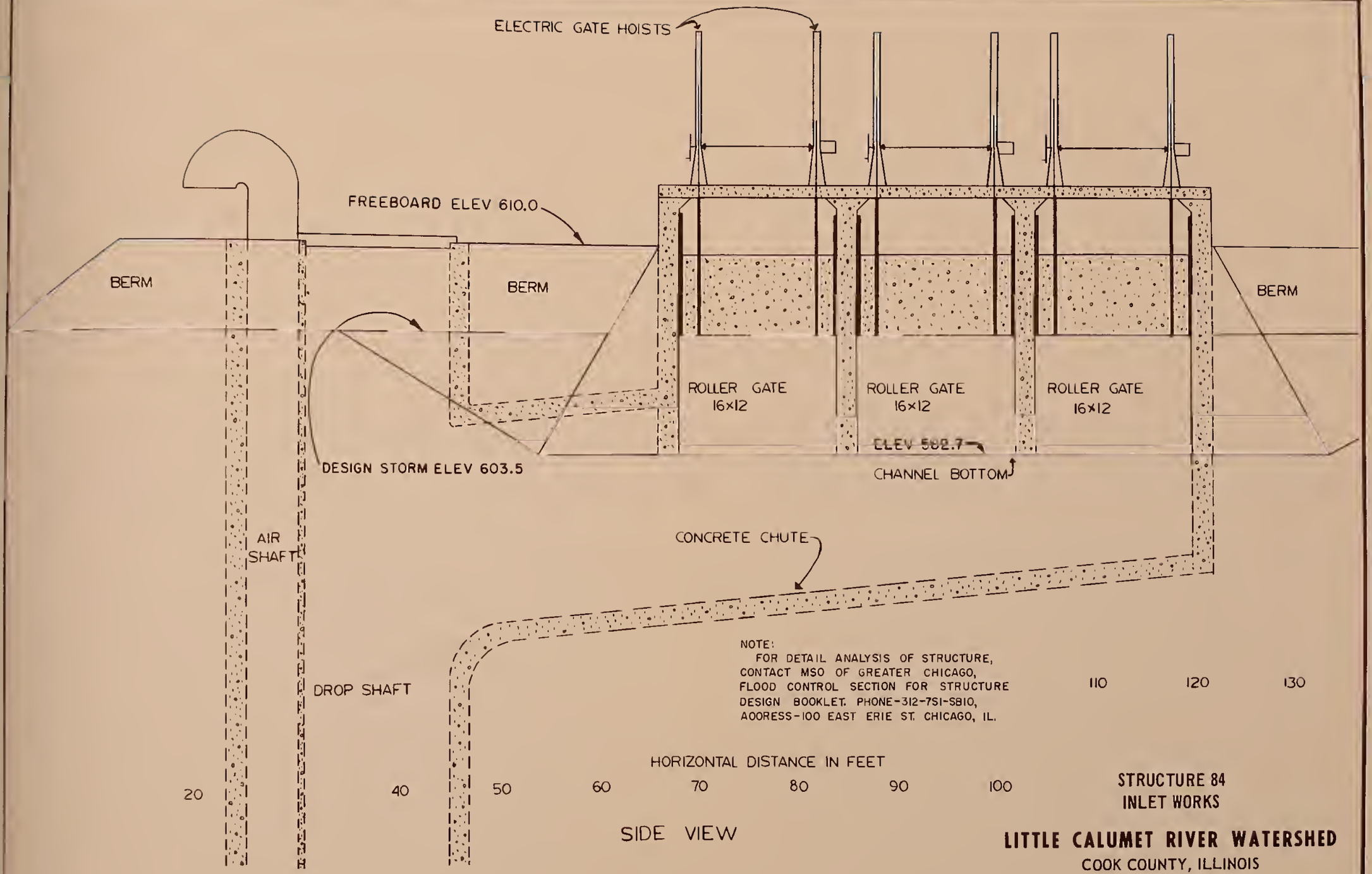
EXHIBIT NO. 3

SHEET 2 OF 3

MARCH 1975

5,N-35,143.6

USDA-SCS-LINCOLN NEBR 1975



SIDE VIEW

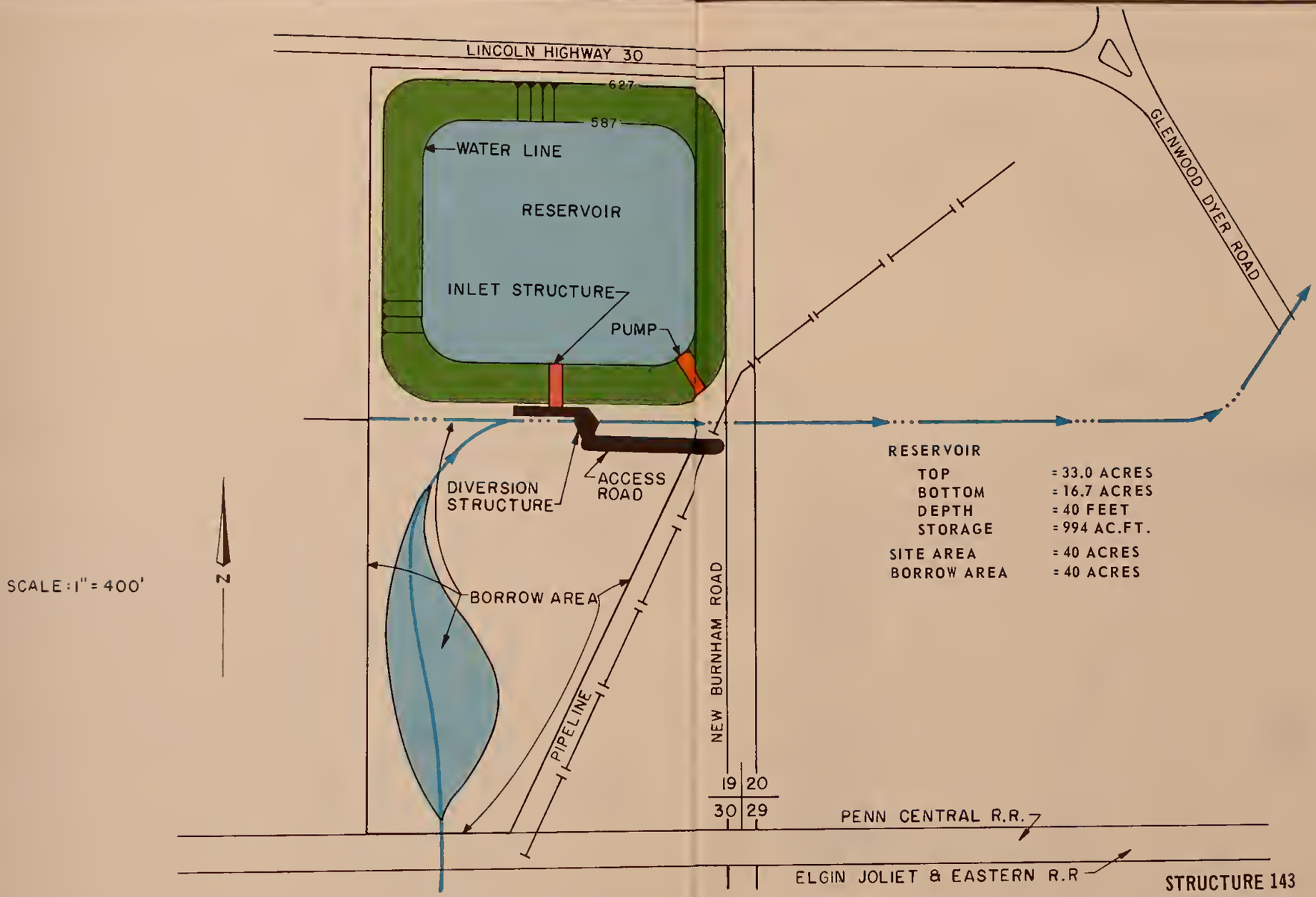
STRUCTURE 84
INLET WORKS

LITTLE CALUMET RIVER WATERSHED
COOK COUNTY, ILLINOIS

EXHIBIT NO. 3
SHEET 3 OF 3

MARCH 1975

S.N-35,143.7



LITTLE CALUMET RIVER WATERSHED

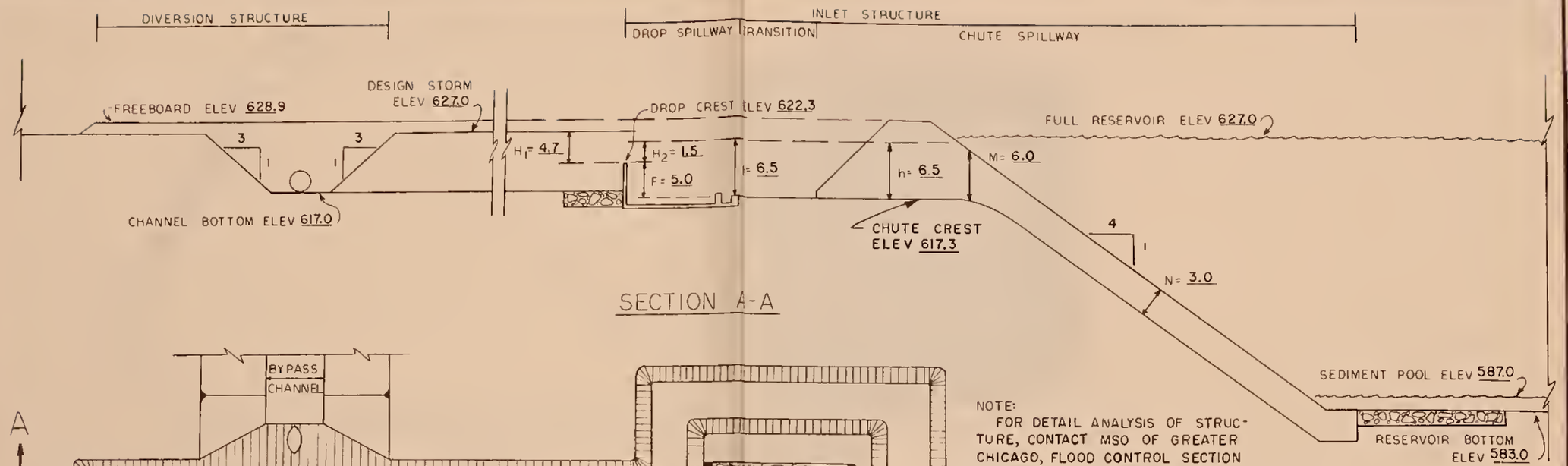
COOK COUNTY, ILLINOIS

EXHIBIT NO. 4

SHEET 1 OF 2

MARCH 1975

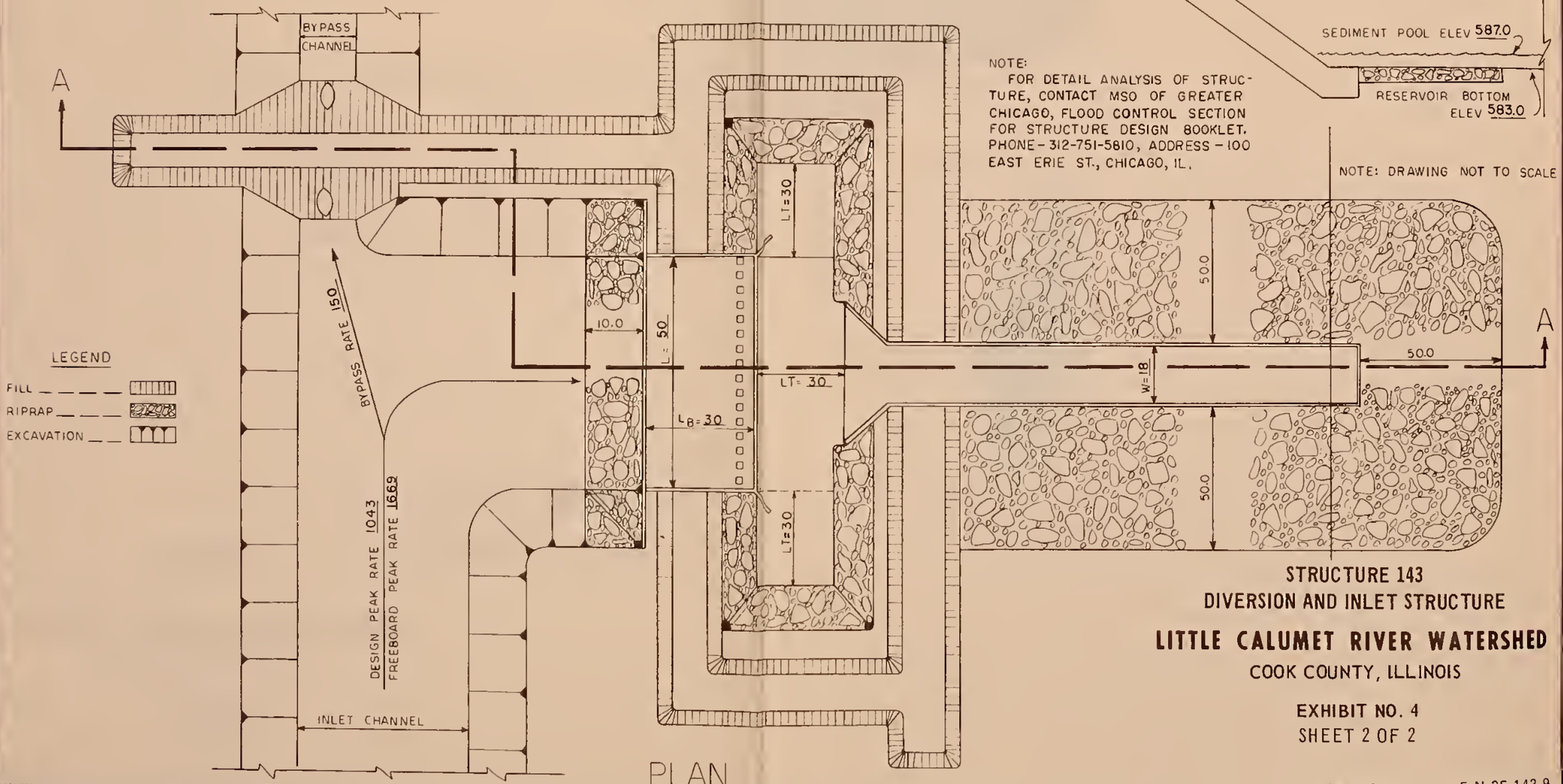
5,N-35,143.8



SECTION A-A

NOTE:
FOR DETAIL ANALYSIS OF STRUCTURE, CONTACT MSO OF GREATER CHICAGO, FLOOD CONTROL SECTION FOR STRUCTURE DESIGN BOOKLET. PHONE - 312-751-5810, ADDRESS - 100 EAST ERIE ST., CHICAGO, IL.

NOTE: DRAWING NOT TO SCALE



PLAN

STRUCTURE 143
DIVERSION AND INLET STRUCTURE

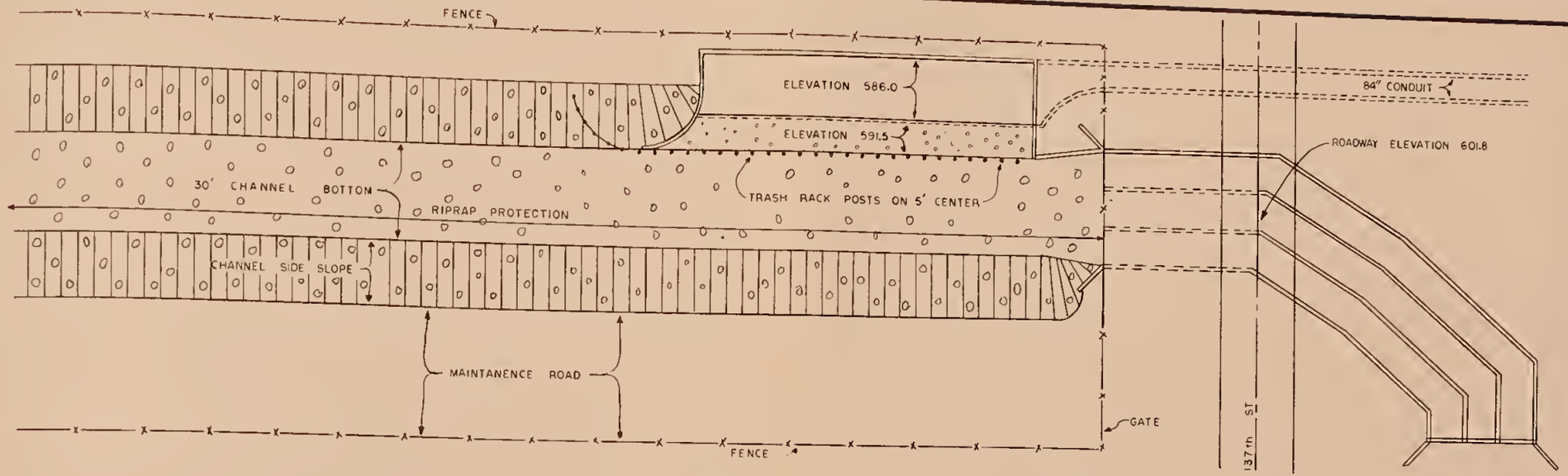
LITTLE CALUMET RIVER WATERSHED
COOK COUNTY, ILLINOIS

EXHIBIT NO. 4
SHEET 2 OF 2

MARCH 1975

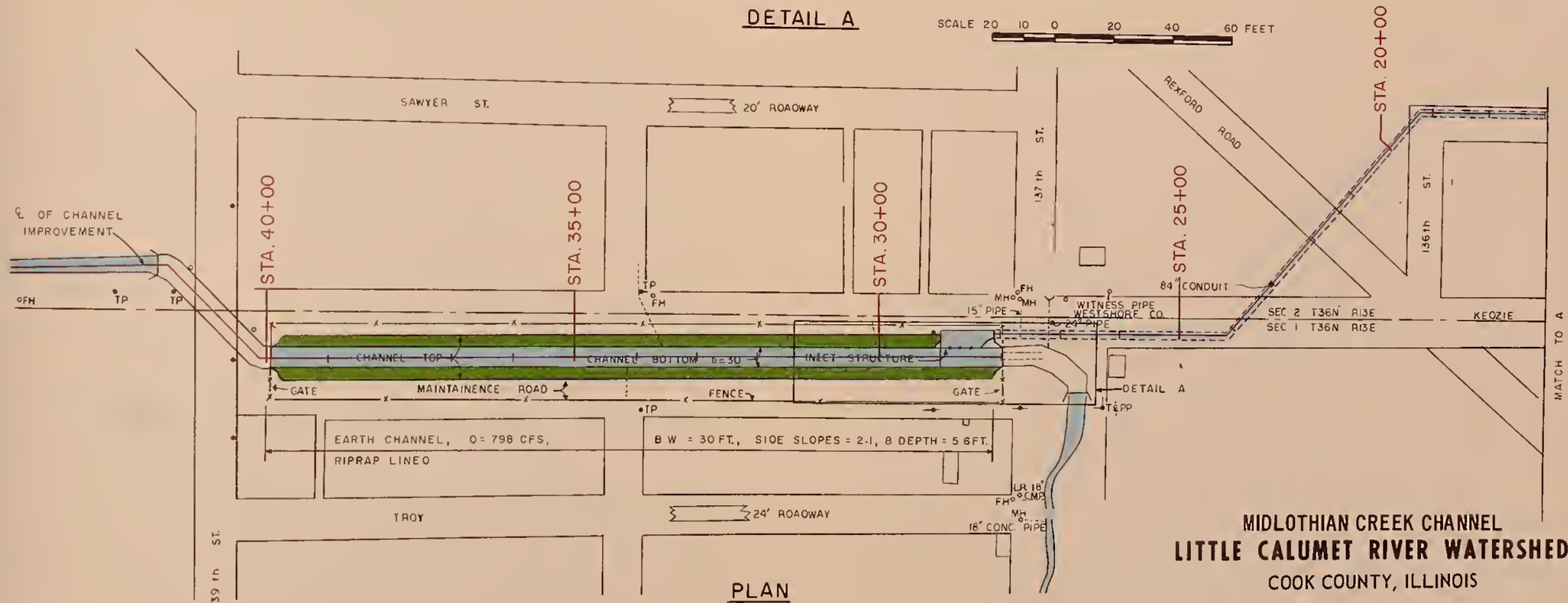
5,N-35,143.9

USDA SCS-LINCOLN, NEBR 1975



DETAIL A

SCALE 20 10 0 20 40 60 FEET



PLAN

SCALE 100 50 0 100 200 300

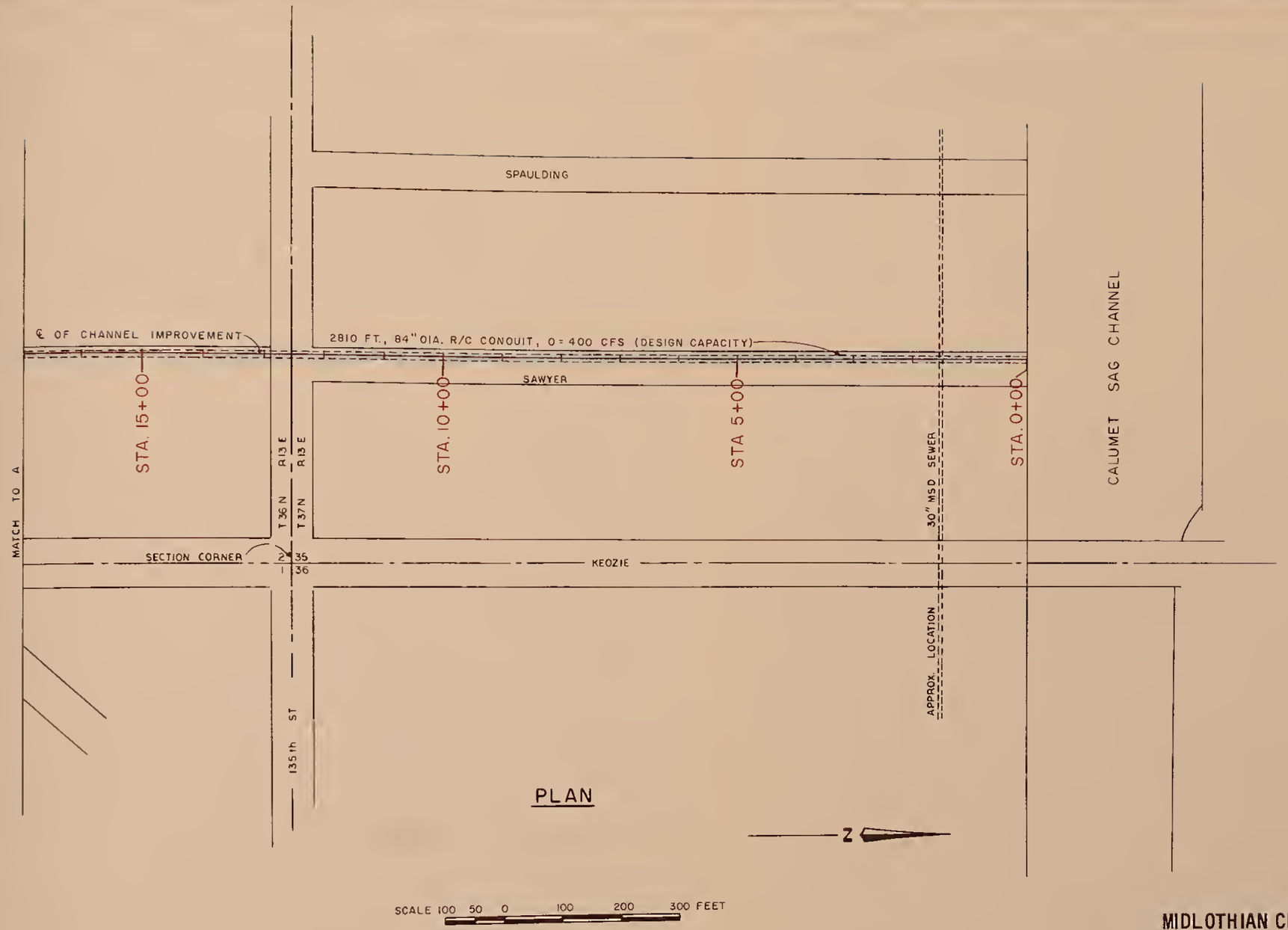
N

MIDLOTHIAN CREEK CHANNEL
LITTLE CALUMET RIVER WATERSHED
COOK COUNTY, ILLINOIS

EXHIBIT NO. 5
SHEET 1 OF 2

MARCH 1975

5,N-35,143.10



MIDLOTHIAN CREEK CHANNEL

LITTLE CALUMET RIVER WATERSHED

COOK COUNTY, ILLINOIS

EXHIBIT NO. 5
SHEET 2 OF 2

MARCH 1975

5,N-35,143.11

4564-SCS-LINCOLN, NEBR 1975

STA. 1+00 TO STA. 7+00

CONCRETE CHANNEL
BASE WIDTH= 12 FT.
DEPTH= 6.6 FT.
SIDE SLOPES= VERTICAL
HYDRAULIC GRADE= 0.0005 FT./FT.
Q= 426 C.F.S. (DESIGN CAPACITY)

STA. 7+00 TO STA. 36+00

EARTH CHANNEL
BASE WIDTH= 14 FT.
DEPTH= 6.6 FT.
SIDE SLOPES= 2:1
HYDRAULIC GRADE= 0.0005 FT./FT.
Q= 382 C.F.S. (DESIGN CAPACITY)

STA. 36+00 TO STA. 57+00

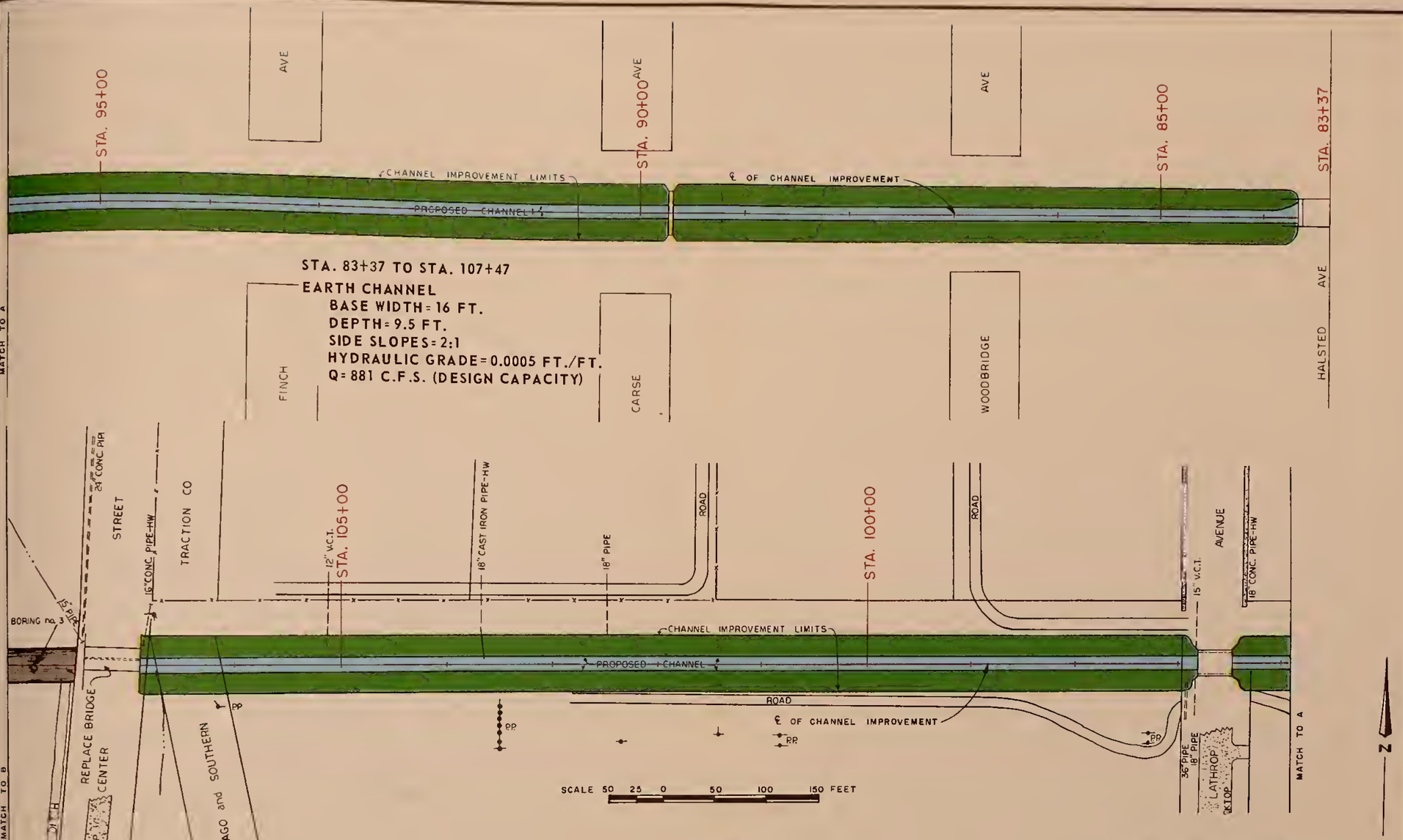
REINFORCED CONCRETE BOX CONDUIT
10 FT. (WIDTH) X 5 FT. (HEIGHT)
HYDRAULIC GRADE= 0.002 FT./FT.
Q= 300 C.F.S. (DESIGN CAPACITY)

NATALIE CREEK CHANNEL AND CONDUIT
LITTLE CALUMET RIVER WATERSHED
MIDLOTHIAN
COOK COUNTY, ILLINOIS

EXHIBIT NO. 6
SHEET 1 OF 1

MARCH 1975

5,N-35,143.12



PLAN

CALUMET UNION DRAINAGE DITCH

LITTLE CALUMET RIVER WATERSHED

COOK COUNTY, ILLINOIS

EXHIBIT NO. 7

SHEET 1 OF 5

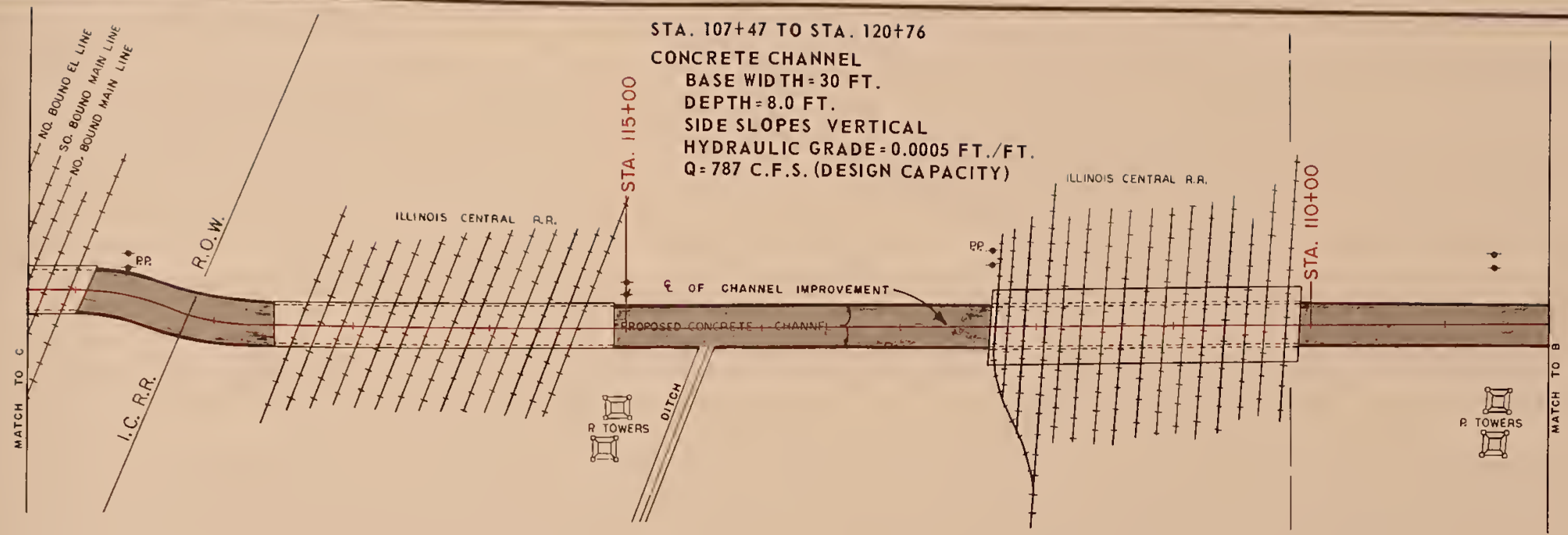
MARCH 1975

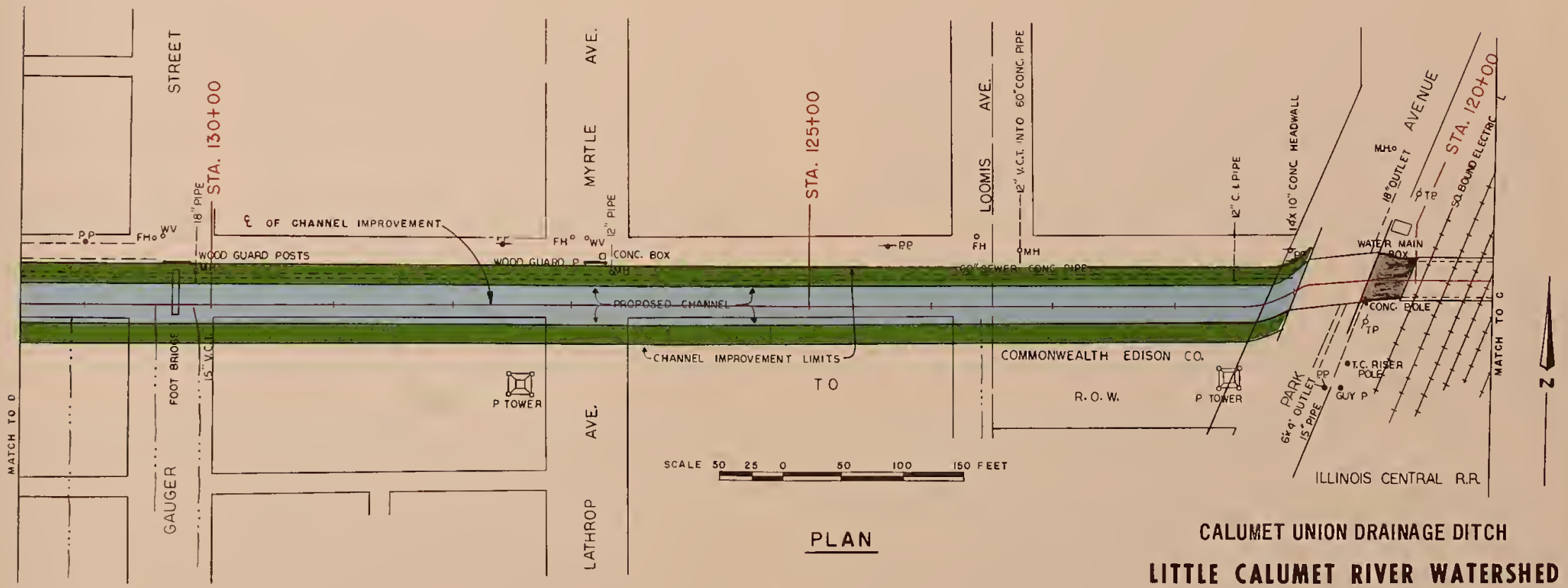
5,N-35,143.13

USDA SCS-LINCOLN, NEBR. 1975

STA. 107+47 TO STA. 120+76

CONCRETE CHANNEL
BASE WIDTH = 30 FT.
DEPTH = 8.0 FT.
SIDE SLOPES VERTICAL
HYDRAULIC GRADE = 0.0005 FT./FT.
Q = 787 C.F.S. (DESIGN CAPACITY)





PLAN

CALUMET UNION DRAINAGE DITCH

LITTLE CALUMET RIVER WATERSHED

COOK COUNTY, ILLINOIS

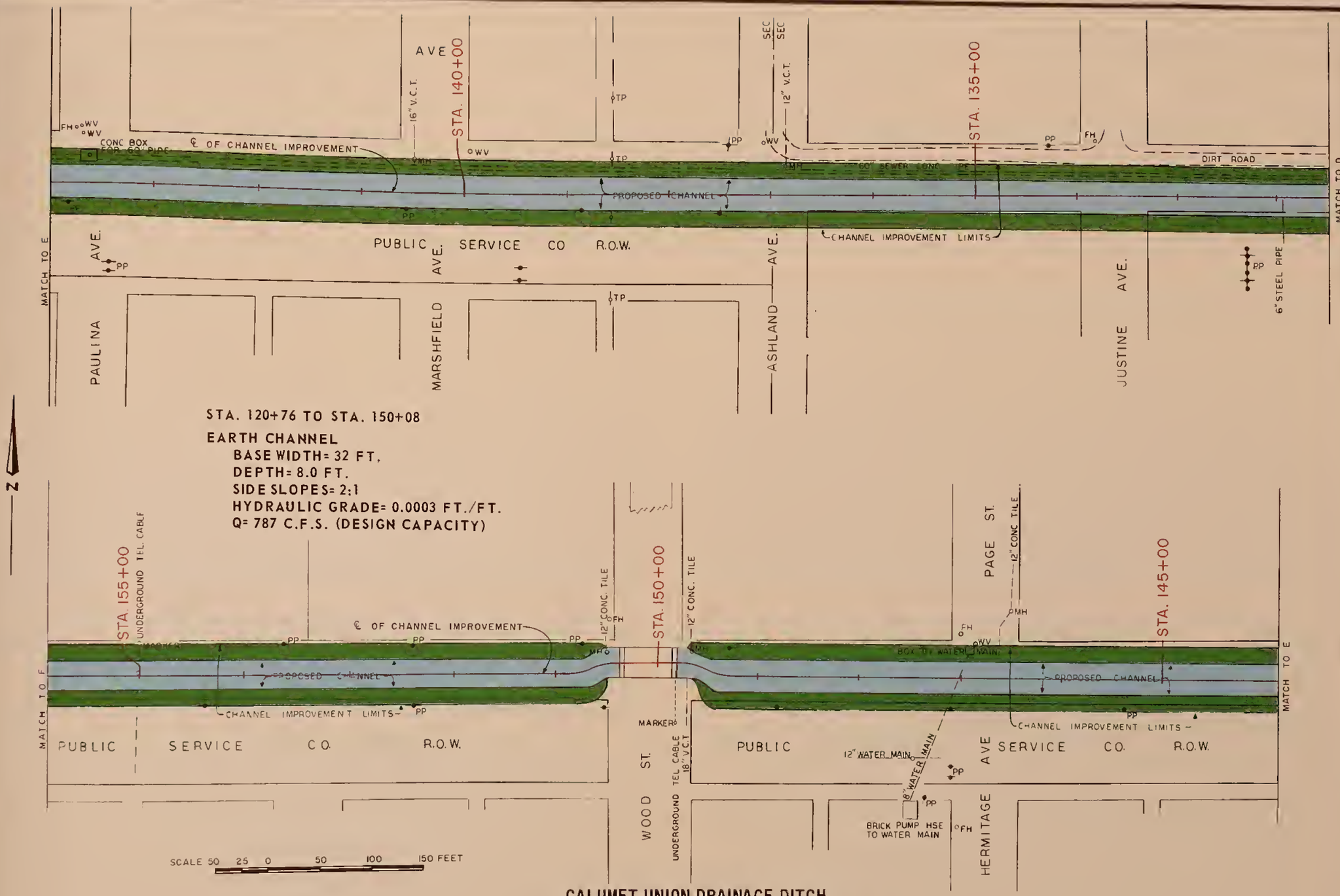
EXHIBIT NO. 7

SHEET 2 OF 5

MARCH 1975

5,N-35,143.14

USDA SCS LINCOLN, NEBR 1975



PLAN

CALUMET UNION DRAINAGE DITCH

LITTLE CALUMET RIVER WATERSHED

COOK COUNTY, ILLINOIS

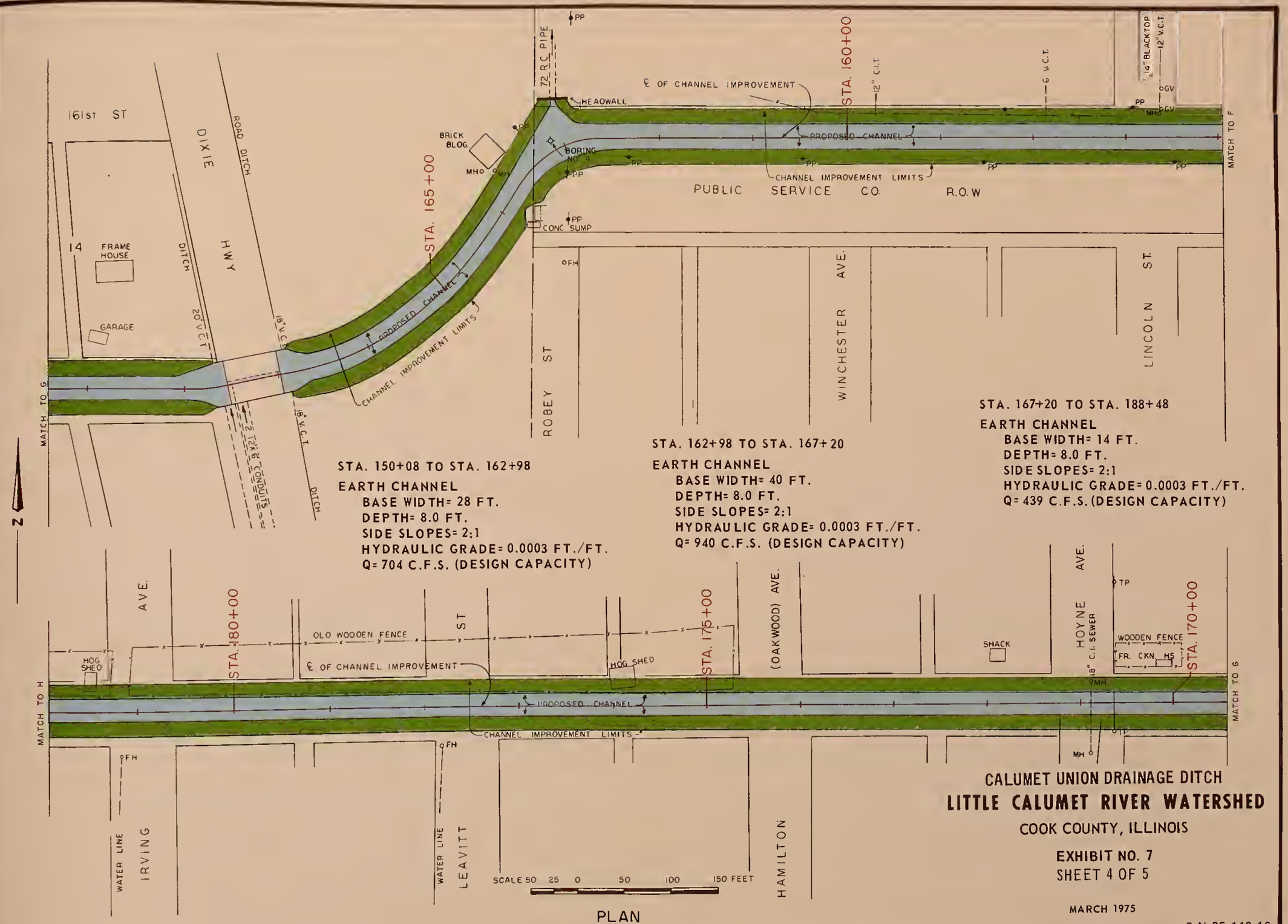
EXHIBIT NO. 7

SHEET 3 OF 5

MARCH 1975

5,N-35,143.15

USDA SCS LINCOLN NEBR 1975



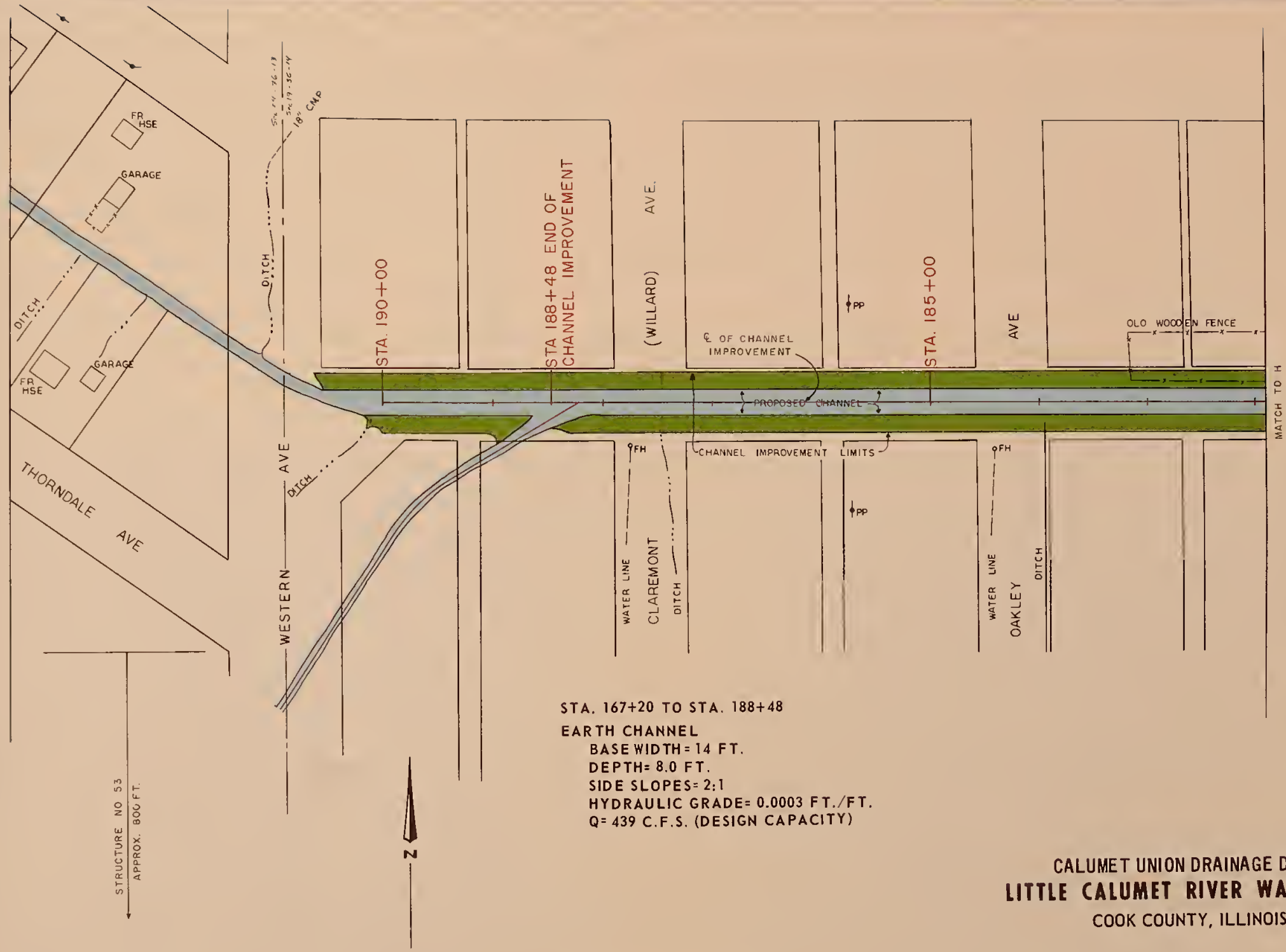
CALUMET UNION DRAINAGE DITCH
LITTLE CALUMET RIVER WATERSHED
COOK COUNTY, ILLINOIS

EXHIBIT NO. 7
SHEET 4 OF 5

MARCH 1975

5,N-35,143.16

USDA SCS-LINCOLN, NEBR 1975



STA. 167+20 TO STA. 188+48

EARTH CHANNEL

BASE WIDTH = 14 FT.
DEPTH = 8.0 FT.
SIDE SLOPES = 2:1
HYDRAULIC GRADE = 0.0003 FT./FT.
Q = 439 C.F.S. (DESIGN CAPACITY)

SCALE 50 25 0 50 100 150 FEET

PLAN

CALUMET UNION DRAINAGE DITCH

LITTLE CALUMET RIVER WATERSHED

COOK COUNTY, ILLINOIS

EXHIBIT NO. 7
SHEET 5 OF 5

MARCH 1975

5,N-35,143.17

USDA SCS-LINCOLN, NEBR 1975

ADDENDUM

FLOODWATER MANAGEMENT PLAN

LITTLE CALUMET RIVER

Each year the Water Resources Council will announce the discount rate to be used by all water resource planning agencies during the fiscal year. The discount rate used in formulating the plan is 5 7/8 percent. The rate shall be raised or lowered no more than one-quarter of one percent for any year.

An array of interest rates is used in the following table to display the impact on computed benefits and costs of the Selected Plan.

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Interest Rate (Percent)	Total Beneficial Effects (Dollars)	Total Adverse Effects (Dollars)1/	Net Beneficial Effects (Dollars)
6 7/8	3,152,300	2,451,900	700,400
6 5/8	3,152,300	2,372,300	780,000
6 3/8	3,152,300	2,292,300	860,000
6 1/8	3,152,300	2,212,700	939,600
5 7/8	3,152,300	2,133,500	1,018,800

1/ Price Base 1974

MAY 1975